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Taking power seriously: Towards a power-sensitive approach for transdisciplinary action research

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ABSTRACT

In this paper, we focus on transdisciplinary action research to explore the key challenge of post-normal science – how to deal with power. First, the paper reviews the literature on stakeholder inclusion and identifies a methodological dilemma trapping transdisciplinary action research between the promise of effectiveness and inclusiveness and the danger of power asymmetries affecting the research process and outcomes. We then develop a framework distinguishing three different power-related tensions permeating transdisciplinary research promises: the systemic level of institutions, the heterogeneous stakeholder group, and the role and position of the researcher. We provide concrete literature-based tools for dealing with each of these tensions and mould a power-sensitive approach for transdisciplinary action research.

1. Introduction

Post-normal science (Funtowicz & Ravetz, 1993), multi-stakeholder science (Pielke, 2007), mode 2 (Nowotny, Scott, & Gibbons, 2001), and other approaches have long advocated for the inclusion of stakeholders in decision-making processes that involve science and that are marked by uncertainty, value conflicts, and urgency. In the past two decades, these frameworks were operationalised into research designs such as transdisciplinary, transformation, or transition research (Hansmeier, Schiller, & Rogge, 2021; Hölscher et al., 2021; König & Ravetz, 2017), approaches to policy development and implementation e.g. pragmatist complexity (Ansell & Geyer, 2016), extended participation model (Funtowicz, 2017), technologies of humility (Jasanoff, 2007, 2018), or approaches to urban governance and planning, such as urban labs or city labs (Bulkeley et al., 2019; Evans et al., 2016; Scholl & De Kraker, 2021).

Here, these approaches are considered part of the ‘extended family’ of the PNS, a family sharing similar ideas about how to modify research practices. They all aim to implement PNS aspirations of knowledge cocreation and dialogue in the context of ‘real life’, nestling next to and within established structures in science and policy-making systems. In their efforts to modify dominant science perceptions and to build new science-making practices, PNS proponents have focused on questioning the perceptions of science as a truth- (and solution-) producing machine, and on developing alternative perceptions where scientific expertise enters into a dialogue with stakeholders in a common exploration about what matters for whom, and what can be done about that. Hence, priority has been given to the question of how to enact dialogue and how to build extended peer communities. However, little attention has been paid to the systematic analysis of the unfolding of power dynamics in these processes. Scientists who, in line with PNS ideals, themselves

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engage in a real-life context, be it as public intellectual or as transdisciplinary scholar, become boundary objects, blurry and undefined, floating in an institutional void of contradicting expectations. They step out of the ivory tower into the real world, making a transition from knowledge games to power games¹, where the power of argument might be less important than the argument of power (Flyvbjerg, 2001).

The main argument of this paper is that the PNS extended family in general, and transdisciplinary research in particular, lacks effective capabilities for detecting and coping with the power dynamics that infiltrate transdisciplinary processes of knowledge and policy co-creation. Consequently, researchers in transdisciplinary settings face several types of problems, specifically but not exclusively that of researching and realising a co-opted version of sustainability, as well as that of a lack of long-lasting outcomes (Scholl et al., 2018; Strumińska-Kutra, 2016).

In this paper, we critically reflect on how participatory and dialogic ideals are practiced in transdisciplinary action research and conclude that the effectiveness and integrity of transdisciplinary action research is threatened if it does not include assumptions about the social dynamics of power in its theoretical and methodological framework. Our analysis diagnoses power-related risks and proposes ways of managing them.

In what follows, we review the current methodological discussions about research, including stakeholders, aiming at the advancement of both knowledge and practice. We contend that issues of power are largely ignored in these methodological accounts. Instead, the idealising assumption prevails that people participate because they want to learn and improve the effectiveness of action, which leads to a focus on how to facilitate learning and the dissemination of lessons. We balance this pragmatist assumption about people's willingness to learn and experiment with a more critical perspective on how people use (scientific) knowledge to rationalise and legitimate decisions already taken and as a means of persuasion (Mirowski, 2020; Pereira & Saltelli, 2017; Pielke, 2007; Rayner & Malone, 1998). We combine a pragmatist with a critical perspective to explore how democracy and openness can be achieved in transdisciplinary action research settings without being naïve to power dynamics throughout the process.

To unpack these power dynamics, in a second step, we apply and further develop an analytical framework illuminating three major power related tensions that penetrate collaborative approaches to research (Strumińska-Kutra, 2016): (1) tensions between participatory/deliberative processes and cultural, institutional, and social environments that are hostile towards dialogue, (2) tensions within 'extended peer communities' which are heterogenous in terms of values, interests, and ability of their realisation; (3) tensions between the different roles of the researcher who exercises power, not only as an expert and arbiter of knowledge, but also as an initiator/organizer/facilitator of the process. By using examples from transdisciplinary action research, we show how democratic deliberation is performed and penetrated by power effects in practice. Our literature review, backed by our own practice in transdisciplinary action research, shows how each tension results in concrete problems in the practice of transdisciplinary action research processes. These are: (1) how to embed solutions developed in transdisciplinary action research setting into the surrounding institutional structures (of the local government, organisation, and community/policy setting); (2) how to balance power asymmetries emerging in the community of enquiry; and (3) how to cope with researchers' own power as well as value agendas and interests. We propose to use this framework as a power-sensitizing tool to identify potential power-related issues in transdisciplinary action research settings.

While considering each of the three tensions, we demonstrate how projects following PNS aspirations can develop strategic and methodological responses to cope with each of the abovementioned tensions. The three responses address the three tensions in order to better position transdisciplinary approaches as part of the science and policy system (Hölscher et al., 2021). The first response refers to building institutional infrastructure that enables and legitimises transdisciplinary action research, thereby challenging the inertia that perpetuates status quo. These rules encompass translating social relevance, knowledge uptake, and inclusivity into research funding mechanisms and new institutional settings at the interface between science and society where the normative dimensions of science and practice can be acknowledged and mediated and where trust building takes place (Miller, Muñoz-Erickson, & Redman, 2011). The second response focuses on the research design and emphasises that collaboration requires extra resources and tools, not only for learning and knowledge integration, but also for facilitation and conflict mediation. The third response is that a better positioning of transdisciplinary action research requires equipping researchers and research partners with skills such as communication, collaboration, knowledge brokering, and reflexivity, including reflexivity upon one's own power position. Together, these three responses to power-related tensions can prompt a shift in existing transdisciplinary action research practices towards more power-sensitive, democratic, and effective approaches.

2. Stakeholders inclusion: promises and risks

In the past two decades, new modes of research, such as 'post-normal science', 'mode 2 knowledge production', or 'transdisciplinarity', have made their way from postulation to practice (Newig, Jahn, Lang, Kahle, & Bergmann, 2019). This shift from critical thinking about the role of science in society to critical performativity (Spicer, Alvesson, & Kaerremann, 2009), opens up an opportunity for learning from the challenges that are involved in practising science in line with these "new" guidelines, which imply,

¹ Expression proposed by Jerry Ravetz (personal communication). It is not to suggest that power games do not exist in academia.

among other matters, quality assurance by an extended peer community, reflexivity and critical thinking that openly challenge policy agendas and imaginaries, and an ethos of care (Pereira & Saltelli, 2017). In this section, we briefly discuss a key discussion we identified in the literature on transdisciplinary action research – the discussion between functionalist and critical streams. The functionalist stream sees the inclusion of stakeholders as a win-win situation, a way to increase the quality of knowledge and effectiveness of action. The critical stream indicates that inclusion does not alleviate power asymmetries. Rather, it brings the asymmetries into the research process, where they can possibly shape it. Such a knowledge creation process hijacked by more influential parties only exacerbate power asymmetries instead of reducing them.

2.1. The promise of effectiveness and inclusiveness

Funtowicz and Ravetz (1993) argue that ‘an extension of the peer community is not merely an ethical or political act; it can positively enrich the processes of scientific investigation’. This argumentation reflects the ‘functionalist stream’ of transdisciplinary action researchers, who see the inclusion of non-academic stakeholders as a response to the failure of traditional research approaches. Knowledge of local conditions may determine which data are strong and relevant and may also help to define policy problems. Members of extended peer communities may contribute with ‘extended facts (...) and local knowledge’ that may also embody ‘cultural and moral perspectives’.

Co-creation is also considered as a tool to increase social acceptance and effectiveness of policymaking and/or solutions developed within the process (i.e. the process of enquiry or planning process). According to the functionalist stream, transdisciplinary action research countervails the common failures of traditional research schemes arising from: 1) the inability to integrate different kinds of knowledge from the private, public, and civic sectors, and therefore the inability to address the complexities of social problems (Claude, Ginestet, Bonhomme, Moulene, & Escadeillas, 2017); and 2) technocratic bias, overlooking the diversity of axiological orientations, economic status, and cultural backgrounds (Haider, Kopp, & Pajones, 2016; Levenda, 2019; Schwartz et al., 2015).

In some papers, the capacity to balance inclusiveness and effectiveness, and to produce legitimacy, is perceived as a definitional characteristic of transdisciplinary action research. The examples vary in terms of topics and contexts, from Claude et al. (2017) on involving many participants in the thermal refurbishment of a historical district that helped to design and ‘efficient and acceptable solution’ and in the long run to reduce energy poverty; Cole and Srivastava (2013) and Dvarioniene et al. (2015) on trust building effects of stakeholders involvement in living labs that are ‘investment in the future’; Joller and Varblane (2016) on living labs as tools for increasing users acceptance, to Liedtke, Baedeker, Hasselkuß, Rohn, and Grinewitschus (2015) on living labs as an integrated technological socio-economic approach to enable the optimised interaction of production and consumption. Also in research on sustainable mobility (Joller & Varblane, 2016; Sopjani, Stier, Ritzen, Hesselgren, & Georen, 2019), stakeholders participation is considered an important source of insight. Juujärvi and Pessa (2013) suggest that at different stages of the development of living labs, different actors should take over the steering role, since different competences are needed at each stage (see also Scholl et al., 2018).

2.2. The danger of power asymmetries

At the same time, Funtowicz and Ravetz (1993) indicate that scientific results derived through post-normal processes (i.e. involving extended peer communities) may experience highly political repercussions. There are no guarantees regarding the widespread acceptance of results, and conflicting values may be at stake. Although conscious of associated power problems (e.g. Ravetz, 1990), the founding fathers of the PNS have never integrated power issues into their theoretical framework. Some scholars have picked up on these points, arguing that uneven power and access to the institutionalised decision-making processes can cause the potential ‘capture’ of decision-processes by parties who might have otherwise played a less dominant role (Johansen & Upham, 2019; Juntti, Russel, & Turnpenny, 2009; Turnpenny, Jones, & Lorenzoni, 2011). The same authors point out that one can expect scientific knowledge to be embroiled in a variety of (often multi-scale) political processes, with some actors seeking to open up debates, others seeking to close them down, and all seeking successful outcomes on their own differing terms. Johansen and Upham (2019) concluded that the power problem has structural roots and claim that without institutional structures in place to assist transdisciplinary action research PNS-type approaches, it will be very difficult to undertake PNS because existing rules and norms will be driving the process.

In response to the problem of the practical implications of power asymmetries, ideas of transgressive learning and science emerged focusing specifically on structures of privilege, hegemonies of power, and innovative strategies to arrest systemic dysfunction or systemic violence while foregrounding epistemic, social, and environmental justice (Lotz-Sisitka, Wals, Kronlid, & McGarry, 2015; Temper, McGarry, & Weber, 2019). They explicitly propose introducing the idea of ‘political rigour’ as a tool for promoting reflexivity and consciousness in every step of the research process. Political rigour is understood ‘as the application of methods of reflexivity in knowledge creation through which power relations and explicit values and aims of societal transformation are identified, reflected on, socialised, and evaluated among an extended peer community, and reflected in the research design, methodology and research outputs’ (Temper et al., 2019, p. 11). They further argue that political rigour, similarly as scientific rigour, can be achieved with specific tools. While scientific rigour is secured by the use of scientific methods that ensure the reliability and robustness of results, political rigour can be reached through the design of tools and practices, like games, exercises, etc. that would guide a reflection on political dimensions of research process (Temper et al., 2019).

This study contributes to the development of these tools and practices. We consider these efforts crucial because if the power dynamics of knowledge co-creation processes go unattended, they will become their own caricature. Gaventa and Cornwall warn: ‘participation without a change in power relations may simply reinforce the status quo, adding to the mobilisation of bias the claim to a more “democratic” face’ (Gaventa & Cornwall, 2013, p. 181). In the next section, we provide a power-sensitive framework for stakeholder inclusion in transdisciplinary action research, distinguishing three types of power relationships, so as to facilitate the development of transdisciplinary approaches that are politically aware. In the discussion and conclusions, we provide methodological avenues for addressing each relationship in future research.

3. A framework for power-sensitive transdisciplinary action research

This framework was developed through a systematic analysis of power-related issues in participatory action research (Strumińska-Kutra, 2016). It systematises the phenomenon according to the three major types of power-related tensions penetrating collaborative research. The first relates to *the systemic level of institutions*. Transdisciplinary action research, and more broadly, the ‘extended PNS family’ challenges dominant assumptions about research as taking place outside of policy and societal processes; moreover, it often aims to question and change the social, governance, institutional, and power dynamics that reproduce unsustainable or inequitable patterns in society (Hölscher et al., 2021). This effort is at odds with the scientific activities and norms that are expected and valued by the science system, such as a long-standing historical tendency to deny the existence of political or normative dimensions to the knowledge claims that inform and justify policy decisions (van Zwanenberg, 2020); lack of academic training that develops the ability to recognise and cope with the social dynamics of knowledge co-creation (Ramirez, Ravetz, Sharpe, & Varley, 2019); and last but not least, association of academic success with publications and citations (Newig et al., 2019). This situation has profound implications not only for the ability to generate social impact, but also on researchers’ careers (Bulten, Hessels, Hordijk, & Segrave, 2021; Hölscher et al., 2021; Newig et al., 2019). These institutional arrangements mirror and support the relations of power in a particular time and place, privileging purposive and non-purposive actions, thereby petrifying them (Mahoney & Thelen, 2010). The second power-related tension penetrating transdisciplinary and participatory spaces evolves around power asymmetries within ‘extended peer communities’, as they are heterogeneous in terms of values, interests, and ability of their realisation. Here, power refers to the risk of co-optation by the more active and resourceful party, and therefore the risk of compromising democratic ideals. The third power-related tension refers to *the researcher*, her own values, interests, and agendas, and her power position. To what extent is an academic subject exercising power when framing problems, agendas, ‘including’ the local knowledge and values? The framework proposed here helps to identify and explore these tensions and provides a solid basis for managing power-related uncertainty and ambiguity in the research process.

As argued elsewhere, scholars practising dialogue and knowledge co-creation navigate between three meta-theoretical traditions. When focusing on concrete action and social learning, they act like pragmatists; when emphasising the importance of local knowledge, they act like social constructivists; and when questioning established and dominant patterns of thinking and, in particular, seeking emancipation, they act like critical theorists. This inconsistency is creative because it enables the researcher to avoid the pitfalls intrinsic to each tradition, manage the power effects related to the research process, and thereby conduct an ethical emancipatory enquiry (Strumińska-Kutra, 2016).

3.1. Power-related tensions on the systemic level of institutions: transdisciplinary action research and its institutional context

The science-society relationship is often dominated by rational, positivist, and quantitative approaches of new public management, ‘evidence-based’ approaches, and target/accountancy-oriented ‘scientific’ management (Ansell & Geyer, 2016). Science students are still ‘carefully spoon-fed with facts all through a lengthy education in science’ (Ramirez et al., 2019, p. 77). Science is expected to be relevant to society and at the same time, separate from it. As a result, the top-down, centralising, and hierarchical patterns in relation to policy actors and stakeholders are upheld. By upholding this image of science, the actors involved often assume a much greater degree of certainty and knowledge than realistically can be expected in complex policy situations (Ansell & Geyer, 2016; Johansen & Upham, 2019; van Zwanenberg, 2020).

These deeply institutionalised preconceptions of science and its role in society create a tendency to reproduce the pattern in both conscious (because it is what is rewarded) and unconscious (because it is what is taken for granted) ways. Undoubtedly, the general public’s perceptions of plausible research are deeply rooted in the non-dialogical model of science. The ‘non-traditional’ (participatory, critical) ways of doing research are unpopular (Bulten et al., 2021; Gaventa & Cornwall, 2013) not merely because they are new, and hence not yet sedimented in social imagination, but because they contradict the legitimised way of performing science. Scholars conducting transdisciplinary action research are expected to perform the role of an external and objective academic who delivers analyses and conclusions and uses tangible tools and devices for implementing direct change in organisations. Universities do not reward scholars for interdisciplinarity. Research has found that practitioner involvement in research projects negatively affects both academic publication output and citations, and even the probability of completing PhD theses (Newig et al., 2019).

The problem of inertia constitutes the main challenge of transdisciplinary action research, which is the problem of dissemination and implementation of solutions developed in experimental spaces where members of extended peer community deliberate, test, and

assess possible actions. Without a power-sensitive approach, the goals and results of transdisciplinary action research are likely to be affected by institutional inertia.

Some authors suggest that dialogue spaces opened by transdisciplinary action research can be explicitly used to challenge dominant discourses and power arrangements (Chatterton, Owen, Cutter, Dymski, & Unsworth, 2018; Scholl et al., 2018), or even to develop power awareness and unlock the transformative potential of social initiatives (de Geus et al., 2021). Instead of directly confronting existing discourses and power arrangements, other scholars recommend taking these into account only insofar as they create potential barriers to the dissemination of solutions and practices developed within the living lab (Pettersson, Westerdahl, & Hansson, 2018). However, other scholars observe that collaboration enforced in the name of widely praised participatory ideals is often performed half-heartedly (Ansell & Gash, 2008), which impedes trust building (Thomson & Perry, 2006) and understanding the partner organisations' roles and goals (Hrelja, Pettersson, & Westerdahl, 2016).

Other options to address institutional inertia involve the use of integrated approaches. Integrated energy planning (de Boer & Zuidema, 2015), for example, connects the energy theme with spatial planning to accommodate the integration of energy systems within their physical and socioeconomic landscapes, while the INTENSSS-PA project uses a living lab methodology to provide 'a holistic energy plan, which goes beyond a blueprint for allocating renewable technologies and is based on the involvement of the wider community' (Giannouli et al., 2018 p.14). This approach includes aspects such as the development of spatial concepts, new co-creating strategies, business cases, societal alliances, and institutional changes and formats (Giannouli et al., 2018). The project's goal is to build, develop, and implement a human and institutional capacity-building process related to sustainable energy planning and energy project implementation (Giannouli et al., 2018). Modification of the existing and creation of new institutions is an important part of project design. Partners conduct gap analysis to "(a) identify gaps in current institutional capacities and ways of working (tools, techniques, and practices) and (b) to identify inspirational examples of useful technical, spatial and institutional practices and tools they might use to fill these gaps or add to their current practices and tools' (Giannouli et al., 2018, p. 18).

These attempts at tackling inertia suggest that to perform transdisciplinary action research, it needs to be integrated with strategic action aimed at securing process results. This encompasses explorative analysis of the institutional environment and reflection on (1) what institutional infrastructure is needed to carry out the project and secure its results, and (2) what existing institutions need to be questioned in order to secure the legitimacy of the project. Next to this exploration of the institutional environment, the parties involved, and their values and interests, there is also overtly political work like building networks by partnering with other participatory initiatives, establishing connections with stakeholders from various domains and municipal sectors, securing institutional back-up by integrating the transdisciplinary process into policy documents, and gaining the active support and engagement of high-ranking city officials and policymakers.

3.2. Power-related tensions within 'extended peer communities': transdisciplinary action research and its heterogenous stakeholders

Transdisciplinary action research aims to include diverse stakeholders from different disciplines and societal domains throughout the entire research process. However, gathering a stakeholder group that is heterogenous and have them interact in a constructive way proves challenging (König & Ravetz, 2017). Transdisciplinary action researchers have started to develop structured methods of knowledge integration and brokering, as well as strategic planning methods such as participatory and collaborative modelling (Carrera & Mendoza, 2017), scenario planning and visioning (Ramirez et al., 2019; Sheppard et al., 2011), and transition management (Loorbach, Frantzeskaki, & Huffenreuter, 2015; Rotmans, Loorbach, & Kemp, 2016). These approaches can help to effectively integrate different strands of knowledge. However, knowledge integration does not sufficiently address neither differences in values and interests nor the problem of power asymmetries between stakeholders. These differences and asymmetries often emerge only throughout the process of a transdisciplinary action research project, and can then lead to a different perception of the overall aim of collaboration (Scholl et al., 2018). A frequently observed problem is that people come to realise preconceived plans – 'to get things done' – not for knowledge and learning (Kemp & Scholl, 2016).

Scholars have aimed to address these challenges with approaches reflecting the Habermasian 'ideal speech situation', such as creating 'open communicative spaces' (Kemmis, 2013), 'transition arenas' (Rotmans et al., 2016), or even 'negotiation in good faith' (Ramirez et al., 2019). However, these concepts continue to be criticised for brushing away diversity and, above all, inequality and conflict arising from diverse societal positions. Critics indicate that open communicative spaces can be sites of oppression of minority groups, values, and knowledge (Wakeford, Singh, Murtuja, Bryant, & Pimbert, 2013), which can trigger the adverse and undesired result of disempowerment (Hölscher, Wittmayer, Avelino, & Giezen, 2019). Not surprisingly, the need to manage power dynamics and, more generally, inequalities penetrating transdisciplinary arenas, is one of the most frequently mentioned challenges for transdisciplinary action researchers.

Acknowledging such tensions and conflicts through reflective and self-reflective efforts is crucial, as well as giving a voice to unrecognised groups and interests (Johansson & Lindhult, 2008, p. 105). One of the pressing questions that transdisciplinary action researchers see themselves confronted with is: should a researcher intervene when faced with power asymmetries, even when their interventions put the whole project at risk? Strengthening the critical perspective by creating room for reflection raises the feasibility problem: how are we to invite those in power to deconstruct and minimise their possibilities of influencing the decision-making

processes? When we convince them, how do we prevent their domination within the dialogue? Many times, researchers and other stakeholders involved are afraid to confront differences and inequalities in order to avoid disagreements and outright conflict (Holden, 2011). However, in the case of no intervention, problem-solving is likely to become problem-solving by and for elites, bolstering their dominant position within a given enquiry context (Johansson & Lindhult, 2008; Strumińska-Kutra, 2016).

Therefore, we argue for instituting a more power-sensitive culture, making power discussable throughout transdisciplinary action research processes. Such a culture should not aim at annihilating power but at making it visible and, at the very least, pro-actively constraining original and emerging inequalities within that particular transdisciplinary action research process. This requires power-sensitive facilitation and mediation of the research process. Through this, researchers may find themselves in the role of ‘inclusiveness advocates’², actively seeking missing voices. This choice does not come without challenges either, because going too far with an ‘anti-hegemonic’ agenda poses a danger for working relationships with practitioners (Hölscher et al., 2021). Critical pragmatist approaches in planning studies advise observing mediators as they anticipate conflict, negotiate differences, leverage expertise, work with (re)framings of problems, dismantle hostility, and break barriers of fear and anxiety (Laws & Forester, 2015). In a similar way, transdisciplinary action researchers need to perform a complex work as they seek to align multiple and conflicting public goals and benefits and connect the worlds of ‘knowledge’, ‘action’, and ‘politics’.

One may wonder how well researchers are equipped for this task, or whether support may be needed from ‘neutral’ outsiders and professional facilitators. Recent urban living lab projects, such as SUMMALab³, work with a boundary organisation (at the interface of policy and research) as a facilitator of the transdisciplinary action research. Others, like SONNET⁴, advise partnering cities to reach out for professional facilitators in urban laboratories. The practice of facilitation can be extended with a reflection group that oversees the process from a power-sensitive meta-level. However, all others involved need to appreciate that such a reflection group adds another power dynamic to the overall process.

Facilitation is not the only aspect of a transdisciplinary action research practice in which power tensions in the included stakeholder group can be addressed. A research design should also consider how the selection of stakeholders plays a part here. Dominant positions, values, and interests become visible when they are confronted with subordinated ones. Subordinated positions, values, and interests, on the other hand, will never easily find their way into being represented in a stakeholder group for transdisciplinary action research. Björgvinsson, Ehn, and Hillgren (2012) proposed the use of an agonistic participatory design to provide more space to diverging and marginalised voices in transdisciplinary action research. Building on the tradition of participatory design, they propose bottom-up long-term collaborations among diverse stakeholders in ‘agonistic public spaces’, where consensus is not the ultimate aim.

3.3. Power of the researcher: transdisciplinary action research and its subject

In transdisciplinary action research, it is not only the validity and credibility of knowledge that matters, but also its value with respect to the desires and interests of the people seeking solutions (Hazard, Cerf, Lamine, Magda, & Steyaert, 2020). Yet, in line with the traditional image of scientists, researchers typically aspire to the ideal of neutrality, reflected in the metaphor of the ‘honest broker’ to guide the role of researchers working at the interface of science, policy, and politics (Pielke, 2007). This may lead academics to limit their involvement in the situation they are studying. By assuming a supposedly neutral position, they try to avoid any form of commitment and responsibility for the stakeholders’ situation. However, leaving power asymmetries untouched means privileging elite voices, the voices of better-positioned and more resourceful groups and individuals, thus contributing to the perpetuation of the existing social stratification (Strumińska-Kutra, 2016). By refraining from discussions of power and domination, researchers risk that these issues will not be discussed at all, because the participants themselves may want to avoid difficult, threatening, or painful issues. By doing so, they ‘unintentionally contribute to the ability of the dominant group to maintain power and perpetuate inequality while preaching coexistence’ (Gawerc, 2006).

Even here, researchers act not *only* for ‘inclusiveness’. When communicating knowledge and facilitating the process of knowledge exchange, researchers inevitably enact power (Kristiansen & Bloch-Poulsen, 2013; Olesen & Nordentoft, 2013). More or less consciously, they selectively encourage certain lines of interpretation, which in turn influence the perception of interests (Schon & Rein, 1994). Hence an ethical relevance of the question ‘To what extent does this facilitation impose the researchers’ conception of the best interests of the parties involved?’ (Strumińska-Kutra, 2016).

Researchers in transdisciplinary settings are still anxious about entering these discussions, either out of fear of losing legitimacy (Olesen & Nordentoft, 2013), or simply because they do not want to give up the power that the dominant science discourse bestows upon them. However, these discussions are necessary in the process of knowledge co-creation. To avoid the abuse of science, we need to be able to clearly articulate limits to knowledge (Ramirez et al., 2019; Ravetz, 1987) and show the value of scientific knowledge while being aware of its limits (Ansell & Geyer, 2016).

It is increasingly acknowledged that transdisciplinary action research necessitates new forms of radical reflexivity (Cunliffe, 2003; Temper et al., 2019). This includes the explicit articulation of values, assumptions, and normative orientations, and renewed attention

² This is a reference to Pielke’s typology of scientists in politics and policy making. It in fact suggests that the four roles he distinguishes do not cover the whole spectrum of post-normal roles and that knowledge co-creation requires guardians of the process with respect to social dynamics and power dynamics in particular.

³ <https://summalab.nl/>.

⁴ Social Innovation in Energy Transitions (SONNET) - the project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 837498

to asymmetries in power among participants engaging in new approaches, methodologies, and processes of co-production (Temper et al., 2019). Indeed, some transdisciplinary action researchers have started to offer insights and design tools, helping to collectively explore researchers' positionality in political (Temper et al., 2019) and epistemological terms (Hazard et al., 2020). While positionality in political terms helps to identify and collectively reflect on one's own power position, values, and preferred aims of social transformation, positionality in epistemological terms uncovers how research choices can lead to a wide range of research stances about a situation that requires action. It allows researchers to articulate and discuss research stances that are typical in their 'disciplinary matrix', that is, discipline-specific ways of problem framing, investigating, and considering proof. The latter is not only useful in interdisciplinary dialogue, but also for translating scientific knowledge and its limits into non-academic languages (Dembek, Strumińska-Kutra, & Dańkowska, 2020; Hölscher et al., 2021). These tools help to manage divergent perspectives on the research, uphold knowledge pluralism, and enable them to be used constructively to tackle wicked problems. Although the need for such reflexivity is increasingly acknowledged in academic environments, students are still left without the training necessary to capture the above issues or develop the skills necessary to address them (Öberg & Campbell, 2019).

4. Discussion and conclusion

All transdisciplinary action research approaches acknowledge that research is a social endeavour (Pereira & Saltelli, 2017; Ramirez et al., 2019). However, the resulting social dynamics of a transdisciplinary research project are often not addressed by the research design (Hölscher et al., 2021). Therefore, as this paper argues, transdisciplinary action research in its current forms has too little scope and no integrated approach for coping with power inequalities and conflicts. This paper provides a framework to sharpen the eyes of transdisciplinary action researchers for three different types of interrelated power tensions and methods and tools for addressing them throughout the research process. Our study contributes only a few building blocks to a reflexive conversation on better approaches. Practising knowledge co-creation within transdisciplinary action research, or more broadly within PNS, requires institutional change in scientific and policy institutions, among others, but not only in methods of science. It means 'muddling-through', or, in other words, performing institutional work: purposive actions directed at the change of existing institutional arrangements (Lawrence & Suddaby, 2006) around knowledge creation and use on many fronts and levels. The considerations presented in this paper not only facilitate greater 'political rigour'; they also provide a roadmap comprising issues that transdisciplinary action researchers in general and the PNS community more specifically need to address if they want to live up to their call to participatory research approaches.

These issues are directly connected with each of the three power-related tensions: on the systemic level of institutions regulating science society relationships, on the level of extended peer review communities penetrated by inequalities, and on the level of a researcher who enacts power in the process of research facilitation and knowledge creation. On the first level, not all researchers can afford to be post-normal scholars, as long as the scientific system provides little incentive to do so (see the trade-off hypothesis; Newig et al., 2019). Second, an 'extended peer community' does not form a community *per se* but can remain a network of actors with diverse interests and values, interconnected by a common concern; therefore, the process of deliberation requires much mediation and facilitation between conflicting parties. Third, post-normal scholars should make their own values, interests, and agendas transparent for discussion to avoid a distortion of the process.

The table below (Table 1) summarises our argument by juxtaposing the diagnosis of a problem (power-related tension), the main dilemma faced by the researcher (issue at stake), work that needs to be done to address the problem and to better position transdisciplinary action research as a part of the science system (institutional work), and methodological tools/concepts that can be used to cope with the problem (methodological solution). The table shows that transdisciplinary research projects require additional infrastructure for the explicit exploration, analysis, and management of socio-political dynamics throughout the co-creation process.

Table 1
A power-sensitive approach to transdisciplinary action research.

Power related tension	Issue at stake for researcher	Institutional work needed	Proposed methodological tools and concepts
Institutional context	Should researchers build socio-political support network around the project?	Reaching out to the institutional environment of the process	Analysis of the institutional context, e.g. through gap analysis (Giannouli et al., 2018) responding the question: what institutional infrastructure is needed to carry out the process and its results
Stakeholders/ 'extended peer communities'	Should a researcher intervene when faced with power asymmetries, even when interventions put the whole project at risk?	Making power (conflicts) visible and discussable	Securing of power-sensitive facilitation and mediation of the research process, e.g. through adopting the role of 'inclusiveness advocate'; employing external facilitator and reflection group overseeing the process; making power an explicit object of inquiry via interviews, group discussions (e.g. see de Geus et al., 2021)
The researcher	Am I indifferent to the process and its outcomes? Am I able to embrace both conservative and radical sensitivities?	Development of institutional structures enabling researchers to (collectively) reflect on own positions and values	Systematic and continuous reflection on researchers' position in the process e.g. through the use of tools and concepts like research stance reflecting tool, (Hazard et al., 2020); 'political rigour' (Temper et al., 2019).

The relationships between power-related tensions are dynamic and complex; therefore, the processes of research are uncertain and ambiguous. Coping with these tensions requires the cultivation of a flexible repertoire of responses (Strumińska-Kutra, 2016). In fact, taking power seriously means embracing the political nature of novel research approaches and developing language and tools that make power, values, interests, and political agendas ‘discussable’ and manageable in the process of enquiry, be that the process of research, or collaborative policy development. Language and tools should help academics practically *improvise* in realistically messy settings that are historically and politically fraught (Forester, Verloo, & Laws, 2021).

Each transdisciplinary research project requires an additional infrastructure for the explicit exploration, analysis, and management of socio-political dynamics throughout the co-creation process. Such an infrastructure can be key for securing scientific quality and ethical integrity through the inclusion of diverse perspectives and knowledge. It is also key for feasibility by securing sufficient institutional, organizational, and political support. This ensures that both the research results and the research process are sensitive to power.

Data availability

No data was used for the research described in the article.
Data will be made available on request.

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