

RADICAL INCREMENTALISM IN ACTION THROUGH INSTITUTIONAL WORK: CASE STUDIES OF EMBEDDED RESEARCH IN SOUTH AFRICA

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ABSTRACT

Sustainability researchers and non-academic actors are working more closely than ever to drive deep structural transformation toward just and sustainable futures. This paper illustrates how embedded researchers in South Africa navigate the political nature of institutional spaces through transdisciplinary action research. We propose radical incrementalism as a guiding philosophy and analyse seven cases using a collaborative autoethnographic approach. The analysis identifies four strategic choices: whether to embed, how to engage critically, when to maintain distance, and how to sustain long-term commitment. These insights illuminate the ethical and political complexities of shaping—or failing to influence—policy change within government institutions.

KEY WORDS: Embedded research; Institutional work; Radical incrementalism; South Africa; Transdisciplinary action research

INTRODUCTION

Sustainability science is undergoing a paradigm shift as climate change and persistent societal challenges demand new approaches (Nagatsu et al., 2020; Ziegler & Ott, 2011). Conventional knowledge production models, which often prioritise academic knowledge

over experiential, local, and practitioner expertise, have struggled to address the complexity of real-world sustainability transitions. In response, scholars increasingly advocate for moving beyond detached observation toward deeply engaged, solutions-oriented inquiry (Fazey et al., 2020; Horcea-Milcu et al., 2024; Marshall et al., 2018; Shrivastava et al., 2020; Wiek & Lang, 2016). As a result, transdisciplinary action research is now a foundation of sustainability science that also includes initiatives in the global South (Brandt et al., 2013; Cockburn, 2022; Hansson & Polk, 2018; Lang et al., 2012; Van Breda & Swilling, 2019). It emphasises integrating diverse knowledge systems and actively engaging stakeholders to ensure that action-oriented knowledge production is academically rigorous and socially and politically relevant, with the ultimate goal of transformative action toward systemic change (Plummer et al., 2022; Wittmayer et al., 2021).

Action research has often been associated with knowledge production that supports the expression of either resistance to injustice and/or the articulation of alternatives to the status quo by oppositional actors of various kinds (e.g., social movements, faith-based institutions, sectoral institutions such as those located in the health, educational, or welfare sectors, etc.) (Beaulieu, 2013; Riedy et al., 2019; Wittmayer & Schöpke, 2014). Transdisciplinary action research (TAR) has emerged as a prominent approach to post-normal science in dealing with the increasing complexity, uncertainty, and urgency of sustainability challenges (Nowotny et al., 2001; Ravetz & Funtowicz, 1999; Van Breda, 2019; Van Breda & Swilling, 2019). The focus on transdisciplinary research reflects a growing recognition that conceptualising science solely as a mechanism for producing definitive truths or solutions is insufficient. Instead, extending epistemic communities is critical to enhancing the salience, credibility, and legitimacy of scientific knowledge within decision-making processes (Cash et al., 2003; Hansson & Polk, 2018; Lawrence et al., 2022; Marshall et al., 2018). Complementing this, the action-oriented research perspective underscores the necessity of reflexivity and iterative engagement, emphasising ‘learning by doing’ as a fundamental strategy for addressing the multifaceted nature of sustainability issues (Popa et al., 2015; Van Breda & Swilling, 2019; van Poeck et al., 2020).

In stepping out of the *ivory tower*, researchers shift from academic knowledge production to contested arenas where power relations largely determine whose legitimacy, credibility, and influence shapes decision-making processes (Popa et al., 2015; Strumińska-Kutra & Scholl, 2022). This shift underscores that transdisciplinary research is not merely an epistemic endeavor but also a deeply political one, requiring that researchers engage in transformative politics and navigate an institutional void filled with conflicting demands and expectations. Thus, they must learn to critically engage with the political ideologies that either explicitly or implicitly shape the governance of the knowledge production processes in which they participate (Avelino et al., 2023; Van Breda & Swilling, 2019).

However, some sustainability researchers find themselves inadequately prepared to navigate the intricate political landscapes inherent in transdisciplinary research (e.g., Anderson, 2023; Thapa et al., 2022; Wittmayer et al., 2024). This struggle partially stems from underestimating the institutional complexities that shape decision-making and the politics of change. In their study, Scholl et al. (2018) revealed that a common yet idealised

assumption among transdisciplinary researchers is that participants, such as decision-makers and knowledge-holders, engage in knowledge-creation processes out of a shared commitment to learning and sustainability. In reality, competing interests, power asymmetries, and hidden agendas dominate these interactions, thereby limiting what researchers are able to understand about what is really going on and, therefore, their ability to influence complex change processes. In this paper, we understand influence not as direct decision-making authority, but as the capacity to shape how problems are framed, which alternatives are considered viable, and how institutional actors engage with new knowledge. For embedded researchers, influence often emerges through relational credibility, timing, and alignment with shifting institutional agendas. This form of influence is subtle, cumulative, and contingent; it is often oriented more toward enabling space for alternative imaginaries than achieving immediate change (Van Breda, 2019).

Strumińska-Kutra and Scholl (2022) urge sustainability researchers to embrace “the political nature of novel research approaches and [develop] language and tools that make power, values, interests, and political agendas ‘discussable’ and manageable” (p. 8) in their transdisciplinary research. Failing to do so risks, according to this view, reinforcing the outdated notion of the *neutral academic* and the façade of intellectual purity, which traps researchers in a false dichotomy: they must choose between pursuing incremental progress—often dismissed as co-optation or greenwashing—and focusing solely on radical transformation, a path that challenges systemic dysfunctions yet struggles to gain traction. Later in this paper, we argue that transdisciplinary action research entails far more nuanced and strategic choices than this binary suggests.

This paper addresses the growing scholarly call for transdisciplinary action researchers to engage seriously with power dynamics in their work (Avelino et al., 2023; Strumińska-Kutra & Scholl, 2022; Temper et al., 2019; Van Breda & Swilling, 2019). We take a step further and argue that, beyond scrutinising power relations within transformative politics, researchers must take seriously the interdependence between themselves and the institutional structures they seek to transform. Doing so results in recognising that researchers’ theories of change through transdisciplinary research unfold within a complex web of uncertainties that defies complete predesign. As a result, researchers must navigate transformative politics by ‘muddling through,’ and this mode of transdisciplinary engagement inevitably produces tensions and contradictions in practice (Lindblom, 1959; Van Breda & Swilling, 2019). Embracing this reality facilitates a reflective practice that transcends merely addressing the technical *how-to* and researcher positionalities; it fosters instead productive debates and a commitment to the normative imperative of *how to do it right*.

We resonate with feminist frameworks that conceptualise the self as a site of internal conflict, arguing that such struggles can better prepare researchers to navigate intricate political landscapes. Thus, this paper focuses on the “troubled subjectivity” (Dashtipour et al., 2024, p. 219) of seven embedded researchers who work within the institutions they seek to transform either as employees or partners engaged in co-production of policy knowledge. It examines how they navigate the tensions between their roles as institutional actors, knowledge producers, and change agents. Their deeply co-productive praxis and meaning-

making processes offer critical insights into the political realities of transdisciplinary research—a contribution that aligns with this Special Issue’s call for action researchers to introduce more transformative forms of praxis to strengthen the epistemic foundations of climate change research (Huang & Harvey, 2021).

This paper uses a collaborative autoethnographic methodology to examine how our embeddedness and transdisciplinary engagements influence—or fail to influence—policy change in South Africa’s transition towards a sustainable future. Embedded researchers, as we will elaborate later, are those who work from within the institutions they seek to understand or transform, often navigating dual roles as both practitioners and knowledge producers. Through critical reflection on our experiences within policy and governance structures, we identify axiological dilemmas that arise when working within the institutions we seek to transform. Moreover, we explore practical strategies for negotiating power dynamics and institutional constraints while advancing transformative agendas for just and sustainable transitions. We aim to demonstrate that radical incrementalism can serve as a guiding philosophy for transdisciplinary action researchers engaged in real-world sustainability challenges. By anchoring radical imaginaries to strategic directionality, this approach empowers embedded researchers to drive transformative action through collaboration with institutional actors rather than imposing change from the outside. Guided by this perspective, this study addresses the following research question: How do embedded researchers make sense of their engagements in institutional work as they navigate the complex dynamics of change processes that are configured in one way or another to achieve sustainability outcomes?

To answer the research question, we contextualise the seven embedded research cases in the literature on transdisciplinary action research, radical incrementalism, and institutional works. We outline the methods employed in this paper, then share and discuss collective reflections. The underlying assumption is that these case studies are embedded within change processes generally referred to as sustainability transitions, drawing from institutional work (Kainiemi et al., 2020; Löhr et al., 2022).

SITUATING THE EMBEDDED RESEARCH CASES

The empirical insights discussed in this paper stem from seven embedded research projects undertaken with Stellenbosch University’s Centre for Sustainability Transitions. These projects span a range of governance levels and institutional contexts in South Africa, including national policy development, energy transition financing, economic restructuring, and municipal sustainability planning.

The projects are: (1) Sustainable development policy formation at the national government between 2002 to 2022; (2) Transition financing for Eskom, the state-owned energy utility, to facilitate its shift from coal-based to renewable energy generation; (3) Long-term action research under the auspices of the National Planning Commission, focusing on investment requirements to achieve net-zero emissions; (4) Development of a strategic vision for a ‘green’ Special Economic Zone in Atlantis, Cape Town; (5) The co-creation of a manufacturing position paper in partnership with an industry strategy committee; (6) The creation of a

decision-support tool for managing the water-energy-food nexus, developed in collaboration with the City of Cape Town and local start-up *GCCX*; and (7) The development of a non-equilibrium economy-climate-energy model, designed to assess the macroeconomic implications of the energy transition, conducted in partnership with the National Treasury, the Development Bank of South Africa, and the French Development Bank. Each project represents a different vantage point to explore how embedded researchers engage with transformative politics in policy, research, and institutional settings. Table 1 describes the contexts in detail. In this section, we elucidate the theoretical foundations underpinning these embedded research cases, thereby situating our collaborative autoethnographic work within the broader framework of sustainability scholarship.

The Transdisciplinary Settings where the Embedded Researchers Operate

As mentioned at the outset, transdisciplinary action research is particularly relevant for addressing wicked problems, such as climate change and the just transition, where uncertainty, competing interests, and diverse stakeholder perspectives require co-produced, context-sensitive knowledge (Beaulieu, 2013; Jacobs, 2018; Swilling, 2020). Transdisciplinary action research has gained momentum, including within climate change and sustainability fields, where researchers are placed in real-world processes (Taylor et al., 2021). Transdisciplinary research can be defined as inter-disciplinary research that is conducted with (not for) social actors to generate solutions to real-world problems (Chilisa, 2017; Cockburn, 2022; Van Breda & Swilling, 2019). Unlike traditional disciplinary approaches, transdisciplinary research facilitates collaborative knowledge production among academics, policymakers, and practitioners (Chilisa, 2017; Cockburn, 2022; Van Breda & Swilling, 2019). This position views researchers not as neutral observers, but as active participants in transformative processes (Chilisa, 2017; Lang et al., 2012). In addition, drawing from critical social science, transformative research, and action research, sustainability scholars are increasingly recognising that transdisciplinary sustainability research is not just for knowledge generation but also a means of resisting injustice and advancing systemic alternatives (Hölscher et al., 2021; Nagatsu et al., 2020; Wittmayer et al., 2013). As will be elaborated later, the multiplicity of transition issues makes it necessary to draw “institutional work into transition work” (Löhr et al. 2022, p. 252) in a context that supports embedded researchers (as well as other institutional actors) in bringing about radical alternatives and activities relevant to “creating, maintaining and disrupting” institutions (Löhr et al., 2022, p. 252).

Transdisciplinary research is committed to real-world sustainability problem-solving, necessitating researchers to engage deeply with institutions and societal actors rather than remaining external analysts. In this context, embedded research serves as a relevant method, enabling researchers to navigate institutional complexities from within. Unlike traditional research approaches that position scholars outside of policy and governance structures, embedded researchers operate inside host institutions—such as government entities, public sector bodies, or corporate organisations—while maintaining affiliations with academic institutions (McGinity & Salokangas, 2014). Moreover, embedded research aligns closely with the learning-by-doing and co-productive approach to knowledge production within transdisciplinary research (Jacobs, 2018). Rather than merely documenting institutional

change, embedded researchers actively contribute to shaping policies and sustainability transitions by working alongside policymakers, practitioners, and affected communities.

Embedded researchers play a distinctive role in sustainability transitions by working within institutions rather than as external observers (Lindblom, 1959). Their insider status grants them access to decision-making spaces, enabling them to leverage institutional knowledge and influence change incrementally (McGinity & Salokangas, 2014). The extent of embeddedness varies, with some researchers holding temporary affiliations while others take on long-term institutional roles (Coates & Micken, 2020). Those with short-term or precarious embedded roles, however, often face challenges, such as limited institutional trust, constrained access to decision-making spaces, and vulnerability to shifting political priorities (Cvitanovic et al., 2021). These conditions can limit their long-term influence and transformative potential.

The Theoretical Underpinning of How Embedded Researchers Drive Change *Radical Incrementalism*

Concerns about political rigour are particularly significant for transdisciplinary action research (TAR) scholars working in highly contested political space. The work of the embedded researchers in this paper is set against the backdrop of the so-called 'state capture' years of the Presidency of Jacob Zuma between 2009 and 2018 in South Africa, a period marked by systemic corruption and institutional erosion (Chipkin & Swilling, 2018). Since 2018, under the Presidency of Cyril Ramaphosa, a new public policy agenda has emerged. It aims to clean up the corruption that drove state capture and develop viable policy solutions that address South Africa's persistent poverty and worsening inequalities within a wider context of ecologically unsustainable development. This political transition provides a critical window of opportunity for radical imaginaries to be released and transformative actions within a radical incrementalist approach as a more pragmatic strategy for TAR scholars operating in such politically contested spaces. As explained in the following section, pursuing radical reforms alone cannot be done by relying on radical imaginaries. Instead, they must anchor their radical imaginations in small, context-sensitive interventions that engage with the realities of institutional arrangements.

Charles Lindblom (1959) first articulated the concept of incrementalism in his seminal work, *The Science of 'Muddling Through'*. Lindblom (1959) argued that policy-making is rarely a process of sweeping reforms; instead, it unfolds through successive limited comparisons shaped by information, consensus, and institutional capacity constraints. The *muddling through* approach suggests that small, pragmatic steps facilitate adaptive learning and risk mitigation, making gradual adjustments more feasible than large-scale overhauls.

Building on this foundation, radical incrementalism challenges the assumption that incremental change is inherently conservative. While individual steps may appear modest, their cumulative effect can lead to profound systemic transformation (Swilling, 2020). Unlike conventional incrementalism, which focuses on piecemeal adjustments, radical incrementalism deliberately sequences interventions to shift institutional paradigms over time (Göpel, 2016; Koh et al., 2024). This approach is particularly relevant in governance

systems—both politically contested and more stable—where abrupt reforms often encounter resistance or prove politically unfeasible. By implementing continuous, evidence-informed adjustments, policymakers and organisations can navigate political and social constraints while fostering long-term adaptability and innovation.

South Africa's transition from apartheid illustrates radical incrementalism in action, as gradual policy shifts leveraged institutional openings to dismantle segregationist structures (Swilling, 2020). Following Roberto Unger (2000), this was not achieved by focusing only on the grand structural-institutional obduracy of the status quo that calls for a total, radical, and complete transformation to achieve a new structural alternative. Instead, the focus is on 'what can be done next?' In other words, given the ultimate goal and the constraints on action in the current moment, the focus is what actions can be undertaken now that can best catalyse dynamics of change that can be further exploited later on to make ever bigger impacts. An example would be feed-in tariffs in Germany that were initially regarded by powerful energy companies as marginal and therefore largely ignored. In the end, they triggered such a huge swing towards renewables, many of these companies either had to oppose them or become renewable energy companies themselves (Aklin & Urperlainen, 2018; Jacobsson & Lauber, 2006).

Despite its potential, radical incrementalism is not without criticism. Some scholars argue that it risks legitimising the status quo by prioritising gradual adjustments over the structural transformations needed for deep sustainability transitions (Allan, 2019; Dauvergne, 2024). The Paris Agreement, for example, has been labelled a case of "dangerous incrementalism" (Dauvergne, 2024, p. 2), where dominant discourses shape government policies, leading to piecemeal and inadequate responses to the climate crisis (Dauvergne, 2024). In urgent situations, such as climate change, incremental approaches may fall short, failing to meet the scale and immediacy of the problem. Additionally, fragmentation is a key risk—without strategic coordination, small, disconnected changes may lack coherence, resulting in inefficiencies or contradictory outcomes. To be effective, radical incrementalism requires political literacy, strategic foresight, and critical engagement to ensure that incremental steps align with a shared transformation vision rather than reinforcing institutional inertia. We now turn to the role of embedded researchers in enacting radical incrementalism within institutions.

Institutional Work

Our research paper focuses on transdisciplinary action research that supports the so-called 'institutional work' of researchers embedded within a range of public institutions responsible for formulating radical alternatives to the status quo (Lawrence et al., 2009). The concept of institutional work is helpful. Lawrence and Suddaby (2006) define institutional work as the "purposive action of individuals and organisations aimed at creating, maintaining, and disrupting institutions" (p. 215). This concept underscores the agency of embedded researchers and practitioners in shaping institutional change, particularly within contested political and policy environments (Beunen & Patterson, 2019; Lawrence et al., 2009). A similar approach is one where seed initiatives are utilised for institutionalising

innovations into the regime (St-Laurent et al., 2025). Such an approach also relies on embedding researchers to interact with actors in institutions within which change is sought.

While embeddedness offers strategic advantages, it also introduces political and ethical complexities. The proximity to institutional actors allows embedded researchers to identify leverage points for transformation and shape change from within, rather than imposing solutions from the outside (Lindblom, 1959). However, embeddedness also brings political constraints, as their institutional affiliations shape their ability to challenge dominant paradigms (Jacobs, 2018). In some cases, maintaining relationships with decision-makers limits their capacity to critique prevailing structures openly (Huang et al., 2024). Additionally, embedded researchers face ethical dilemmas, particularly in balancing academic integrity with institutional loyalty or confidentiality requirements (Coates & Mickan, 2020; Newton & Parfitt, 2013; Temper et al., 2019). This tension requires critical engagement, ensuring that researchers remain effective change agents without becoming co-opted by institutional agendas. Power dynamics further complicate this role, as embedded researchers must engage with both decision-makers and marginalised voices, often acting as intermediaries in sustainability transitions (Battilana & D'Aunno, 2009). Successfully navigating these dynamics necessitates political acumen and reflexivity, as embedded researchers must continuously assess their position and the implications of their actions. It is worth noting that these capacities alone do not guarantee inclusive or transformative outcomes—particularly when researchers face structural constraints, such as institutional precarity, limited decision-making power, or risks to personal or professional security. In such contexts, agency may be curtailed, and efforts to foster change can be diluted or obstructed by systemic conditions beyond the researcher's control.

Despite these challenges, embedded researchers are crucial in advancing radical incrementalism. By working within existing institutional structures, they introduce small but strategic reforms that accumulate into long-term transformation. Rather than viewing incremental reforms as compromises, embedded researchers can use them as stepping stones for more profound structural shifts (Battilana & D'Aunno, 2009). This approach demands strategic foresight, the ability to recognise moments of opportunity and skill in negotiating competing interests. We contextualise our argument of key choices below and will return to this point in the discussion.

METHODOLOGICAL APPROACH

Our methodological orientation is grounded in feminist and interpretive traditions, which emphasise the value of situated knowledge, reflexivity, and transparency over neutrality or detachment (Lincoln et al., 2011). Rather than attempting to eliminate subjectivity, we view researchers' positionalities and lived experiences as central to meaning-making, particularly in TAR contexts. In this sense, we understand research integrity not as objectivity, but as a commitment to critically examining how power, positionality, and institutional structures shape our inquiry (Sultana, 2007). Against this backdrop, the collaborative auto-ethnographic approach adopted in this paper allows us to systematically reflect on the "analysis of our experiences and processes" as researchers within ongoing real-world

processes (Hill et al., 2021, p. 73). This method emphasises personal and collective reflection, capturing the tensions and contradictions embedded researchers face in their work.

Study Methods

The study's methodological process unfolded in four key phases. The research process began with fortnightly online meetings between 2024 and 2025, where the authors discussed their experiences as embedded researchers. These conversations focused on critical engagements, methodological challenges, and the institutional complexities of the embedded researchers' respective research projects. The discussions provided a foundation for deeper reflection, helping researchers articulate the strategic and ethical dilemmas they encountered in their institutional work.

Following these discussions, each researcher independently documented their case (see Table 1), providing detailed accounts of the institutional and policy contexts in which they operated. These narratives were structured to clarify researchers' dual roles as knowledge producers and institutional practitioners or bureaucrats, acknowledging the blurred boundaries that often characterise embedded research and viewing these tensions as generative sites of reflection and learning, rather than sources of distortion to be neutralised. Importantly, these reflections were grounded in systematically collected empirical materials, including interviews, public reports, meeting notes, and policy documents, collected and/or generated during each research project. Our collaborative analysis is therefore anchored in this empirical evidence, rather than in memory or interpretation alone.

Building on these individual reflections, the researchers engaged in structured reflexive writing, drawing on axiological reflective questions adapted from Wittmayer et al. (2024). These questions guided them in critically examining who holds power in their research contexts, whose interests are prioritised, and how their work benefits or reinforces existing institutional structures. In particular, they reflected on: (1) What are the competing interests and values at play? Including a conflicted embedded researcher who may also be a mediator for stakeholders with conflicting interests? (2) How do you (embedded researchers) balance between contributing constructively versus 'extracting' what's needed for the research? (e.g. navigating institutional research ethics review process, and 'publishing' for the sake of publishing and/or graduating?) (3) What are subjective judgements of the role in doing TAR? How does it evolve throughout the 'critical' and/or 'engagement' process? (e.g. the outcomes of distancing ourselves from the institutional context, what are the reflections and learning out of this distancing process?). (4) What are the 'radical imaginaries' that the embedded researcher envisions? (e.g., what's keeping you going so that you do not lose sight of the 'engagement' and 'critical' processes?).

The final phase of the research involved six online sense-making meetings (1.5–2 hours each), which were facilitated by Huang, who is an external member of Stellenbosch University's Centre for Sustainability Transitions. In these meetings, the embedded researchers collectively analysed their insights and identified key themes emerging from their reflections. Through these discussions, we critically examined the patterns of power

negotiation, strategic engagement, and institutional navigation that shaped the seven embedded research projects. These reflections were then synthesised into the key findings presented and discussed in the following sections.

All the collaborative dialogues were video recorded, and the transcripts were analysed using thematic analysis in MAXQDA, a qualitative data analysis software. The second and last authors reviewed all transcripts from the case documentation and the sense-making meetings to jointly identify recurring themes, patterns of institutional navigation, ethical dilemmas, and shifts in researchers' roles and strategies over time. This was an iterative process in which initial themes were brought into subsequent sense-making meetings for collective interrogation and reflection. These discussions enabled the author team to refine and validate the emerging analysis. The coding process was guided by sensitising concepts from the literature on TAR and institutional work, while remaining open to inductively generated insights emerging from the data.

Study Limitations

While our approach is grounded in transparency and reflexivity, we recognise that interpretive inquiry carries vulnerabilities (e.g., the potential to overemphasise personal perspectives, unintentionally privilege certain voices). To strengthen the credibility and ethical grounding of our analysis, we prioritised peer interrogation and the surfacing of disagreement throughout the process. These sessions were supported by an external member (i.e., Huang) trained in facilitating collective learning and making visible power dynamics, which helped ensure that differences in voice, institutional positioning, and interpretation were critically examined. In line with Lincoln and Guba's (1985) emphasis on trustworthiness, we also acknowledge the limitations of validating retrospective reflections. Rather than viewing this as a deficit, we emphasise the importance of transparency about the situated nature of our inquiry, offering sufficient detail for readers to draw their own conclusions about the strength and scope of our analysis.

Nonetheless, we recognise that certain dynamics specific to the case contexts and to the identities of those involved were not explicitly engaged in our sense-making meetings. For instance, although gender balance was considered in the composition of the author team and might be assumed to create conditions for surfacing potential issues of patriarchy within embedded contexts, the gendered dimensions of embeddedness and institutional work did not surface in our collective reflections. This suggests that even in teams attentive to gender composition, deeper dynamics, such as those highlighted by feminist institutionalism, may remain unexamined without intentional efforts to foreground them. We see value in openly acknowledging this limitation as part of our commitment to reflexive practice, particularly given the South African context, where institutional work is deeply shaped by the intersecting legacies of apartheid and colonisation, as well as ongoing struggles over social, economic and spatial inequality and contested authority. Recognising these absences invites us to remain attentive to the conditions under which particular forms of knowledge and critique become possible, and to continually refine our collective practices to foster more situated, intersectional, and justice-aware forms of engagement in TAR.

Table 1

Contextualising Seven Embedded Research Projects (see details in Appendix 1)

	Critical Engagements	Policy Context	Institutional work in political space	Institutional work in research space
1	Sustainable development policy formation (2002- 2022)	South African National Government's economic policy portfolios (environment, trade energy, etc)	Integrated sustainability priorities into national policies (2002-2022)	Assessed how sustainability-oriented policies contributed to long-term transition.
2	Transition financing for Eskom's energy shift	Eskom's transition from coal to renewables, decommissioning old power stations	Sourced funding for Just Energy Transition, blending private and public finance	Investigated transition finance's role in achieving net-zero by 2050
3	Investment requirements for net-zero emissions	National Planning Commission, Development Bank of Southern Africa (DBSA), National Treasury, and Presidential Climate Commission collaboration	Assessed financial needs for achieving net-zero while ensuring energy security	Led research partnerships, guided modelling, and presented findings.
4	Green Special Economic Zone (SEZ) in Atlantis	South Africa's GreenTech SEZ, supporting renewable energy manufacturing	Integrated sustainability strategies (net-zero water, carbon, and stewardship)	Examined the evolution of energy imaginaries in Atlantis (1975–2024)
5	Industrial policy and infrastructure-led manufacturing revival	Manufacturing Industry Strategic Committee (MISC) under the Department of Trade and Industry	Led drafting of strategic policy recommendations for industry revitalisation	Analysed policy-making complexities from industry perspectives
6	Decision support tool for Water-Energy-Food Nexus	Multi-institution initiative under South Africa's 2019 Resilience Strategy	Developed a governance-oriented decision-support tool for integrated resource management.	Designed the tool to generate decision-relevant insights with live data
7	Macroeconomic model for energy transition	Just Energy Transition policies, in collaboration with National Treasury , DBSA, and French Development Bank	Led political economy scenarios, data collection, and policy modelling	Simulated macroeconomic vulnerabilities and opportunities in the energy transition

COLLECTIVE REFLECTION

In this article, we have argued for strategic choices embedded researchers confront in their critical engagements as they practice radical incrementalism in situ. In this section, we present the reflections from the actual experiences of the seven embedded research cases.

Choosing to Embed as a Radical Incrementalist

The decision to become a radical incrementalist is not merely a methodological choice but a political and ethical commitment. As one researcher (ER4) put it, “radical incrementalism, as opposed to incrementalism, is a choice—whether you get embedded or not.” The following exchange, in which a researcher (ER2) reflects on their commitment to just transitions by “boosting manufacturing job creation and retention in South Africa” illuminates the point about what *radical* means in radical incrementalism.

ER2: I had thought that our proposal, which our intended audience considered quite extreme because it would essentially change the entire procurement paradigm, was radical.

ER4: Just because you make an argument for a radical change, doesn't mean it's radical. Being a radical incrementalist doesn't mean you participate and just shout and scream about what should happen and everybody just yawns: ‘Yeah, yeah, yeah. We can expect that from her. So let's move.’

ER2: [...] The recommendations to the implementing stakeholder had to be reconfigured [...] and] scale back to include less complex or commonly acceptable changes. So I don't know if this is a part of the process or the end, which makes me wonder if I'm talking to a surface level thing. I am trying to see what radical incrementalism is from my case.

ER4: The discomfort that comes from expressing what you consider to be less radical is counteracted by the satisfaction of triggering a process of change that later allows your more radical stance to gain traction. [...]

In this case, the working group in which the researcher was embedded had to make significant adjustments to focus on more contextually acceptable recommendations—ones that could initiate change without provoking immediate backlash from stakeholders. This evolution from a perceived radical to a moderated stance illustrates a strategic recalibration in the face of institutional inertia.

ER3: My project engages with private partners to develop a digital tool, but at the same time doing it for the government institution.

ER2: ER3's embeddedness is similar to mine in that we are not embedded in the institution we are trying to change, but rather in the institution that is trying to create the solution.

ER3: There are numerous institutional documents that mention that they want to engage with researchers throughout, solve problems and invite collaboration [...] But, there are multiple tensions in my transdisciplinary project [...] when it actually comes time for them to engage in workshops or attend meetings, or to provide data [...] they either don't have time or once I was asked, ‘who asked you

to do this research' [...] their way of these mandates and strategies, then you don't get the type of response and engagement that you well, let me say me, I didn't get the type of engagement or response that I was anticipating [...] I cannot play these politically nuanced games [...] I cannot, because I am solutions-oriented and generally do not come with an agenda.

ER6: If you have the decision, again, would you choose this kind of research approach [...]

ER3: For the effort, no, but for the benefits yes. [...] I think it's a worthwhile struggle in trying to align these two spheres that can benefit each other, but they don't. They don't have the same communication language or they don't have an interface. So yeah [...] I think there is value in creating this interfacing mechanism, I am feeling compelled to say yes because of the solution, not because of my biases [...] the solution is the interfacing and there's a lot that can come from a closer working relationship between people doing research about a problem and the people experiencing the problem.

Radical research, therefore, is not simply about making extreme demands; it involves balancing visionary goals with practicality, even if these actions appear less transformative at the outset. Moreover, the decision to become an embedded researcher is not merely a methodological choice but a political commitment to understanding both the technical intricacies—"the nuts and bolts of a system"—and its contextual power dynamics, allowing them to identify the "acupunctural point" at which to "change a widget" (ER4). This process-oriented approach acknowledges that, while immediate, sweeping reforms may be unattainable, initiating incremental shifts can lay the groundwork for more substantial changes as conditions evolve. In this way, being radical is a political commitment to change, and choosing to be embedded is a deliberate strategy informed by the principles of radical incrementalism (Lindblom, 1959; Swilling, 2020; Unger, 2000).

Choosing to Critically Engage: Friendly Capture or Delaying Capture

Once a researcher chooses to embed, they become "caught up in the power dynamics" (ER4) and are consequently locked into a process of incremental change. Navigating this process requires both a clear, transformative vision and the political literacy necessary to manage shifting alliances, contested agendas, and gradual change processes. As the following excerpt shows, the embedded researcher described how they balanced a steadfast commitment to transformative ideals with pragmatic engagement—selectively collaborating with or supporting key players while deferring critical judgments until a more reflective moment.

I've just come to be loyal to my own ideal in terms of what I want to do in that space. [...] I would say I'm selective in what I choose to do and when. I have certain feelings, for example, about our primary material provider. Even as I see their importance in the industry, I still have opinions that I won't say yet because I don't think the time is right. But this is something I want to reflect on later when I step out. It doesn't mean I'm unaware of it now. I decided that I want to work with them for now because I see beyond my feelings in this moment. (ER2)

This reflection shows that choosing to be embedded forces another set of decisions: “What are you actually going to do if you hang on to a deeper, longer-term, more radical transformative perspective? [...] When do I need to rise up and call for a general strike, considering the constraints?” (ER4). Reflecting on these questions, some embedded researchers actively build reciprocal relationships—a phenomenon we refer to as “friendly capture.”

While embedded researchers saw strategic potential in working with industry stakeholders, they were also keenly aware of competing interests and chose to withhold certain opinions to protect their long-term ability to influence change. This tension is particularly evident in cases where embedded researchers highlighted multiple instances in which they opted not to openly express radical critiques but instead worked incrementally to introduce transformative ideas within institutional constraints. The following excerpt offers an example of how researchers often self-moderate their language to maintain institutional legitimacy:

I have become more aware that the co-development process requires different versions of myself. On one hand, I am co-developing a model with powerful institutions whose underlying principles are understandably not as radical as I am. On the other hand, I have to come across as a nice, quiet gentleman by stopping saying how radical this is long before I stopped doing radical work. (ER1)

You have to make a judgment call about how close to the wind you can sail. Sometimes you make a mistake and you get slapped. You get slapped on the wrist. Or worse, you can get kicked out. (ER4)

This practice of tempering critique exemplifies the long-term strategic mindset required in embedded research. Instead of declaring their initiatives as wholly radical—because, as one might say, “that doesn’t stop you doing it”—researchers carefully moderate their language, positioning themselves not with certainty, but with the hope or expectation that such positioning may allow for greater influence over time.

It is important to note that the *choice* between friendly capture and delaying capture might not seem obvious at the moment. Embedded researchers may start without clear intentions, but over time they must negotiate their roles within institutional structures. This dynamic underscores the importance of continuously returning to their transformative vision and reflecting on their current actions in relation to that vision. In their attempt to friendly capture, one researcher experienced lack of trust from the interviewees.

I find myself navigating the fine line between academic independence and the institutional realities. Balancing multiple accountabilities at the institution was challenging. I had to ensure delivery on the Zero Waste and Net-Zero Water strategies while also facilitating interviews for my research. A key issue was that many interviewees saw me as the institution representative rather than a neutral

researcher, making them hesitant to speak openly for fear of repercussions. Some initially agreed to be interviewed but later withdrew, preferring to speak with someone affiliated with employment opportunities (ER5).

The collective meaning-making process also highlighted that being an embedded researcher is not a static position but an evolving practice that requires researchers to adapt their dual roles over time.

ER1: I constantly have to decide what to give and what to hold?

ER4: Why can't you use the same data for both?

ER1: It's the interpretation of the data that I'm giving away.

ER4: You give it to the group, but you can also use it for the PhD.

ER1: I am the co-author of the paper, which is fine, but I'm very much concerned about the originality of the PhD. Given that you are using the same data and probably we are going to come to most likely same conclusion, but I'm working on conclusions.

ER4: You can say something like, '50% of the material in this PhD chapter was co-developed with the following people.'

ER6: I also think the PhD is where the researcher lens is dominant in the interpretation and might be slightly different from the interpretation [...] where the organization interest is more dominant. [...] The results I would imagine should be that as an embedded researcher, that you have two stands [...] you're prioritising the organisation's interests when working on that. Then when you are a researcher, be more dominant in the PhD interpretation.

However, some researchers opt to "delay" their capture. While this strategy may allow them to wait for the right window of opportunity, it also carries the risk of eventual co-optation. Delaying capture can result from various factors, such as missing the opportunity to engage, feeling compelled to respond to an institution's immediate mandates, or facing dilemmas regarding benefit-sharing between their embedded roles and academic ambitions. One embedded researcher described their struggle to reconcile their policy role with their research identity, leading them to delay their act of capture as a result.

ER8: That was my reason to decide that I might as well get a PhD whilst doing it because I'm expected to really you know, research all these issues as my primary job obviously [...] when on these very tense engagements that I was facilitating where there will be a government, there will be consultants, there will be people that are even, refusing change even within the organisation [...] That was my reason for being an embedded researcher and I see benefits [...] You are trying to create a meaningful change by the ethical consideration and the power dynamics that you have to deal with [...] Without spoiling, you know, relationships with these big departments, because they can easily pull a plug, whether they are pulling a plug of guarantees. For instance, they have power, so it is important to maintain those relations.

ER7: Is there any moment where you felt like you were attempting to wear a research agenda hat and you wanted to push a specific research agenda? Not a diplomatic agenda [...] but you got frustrated? [...] We haven't gotten you as a researcher [...] She (ER8) is delaying the capture...

ER6: I love it. Delay capture.

ER7: Yes, just delaying to come in as a researcher. She's still enjoying being a politician. She forgets that she has to play the researcher role, and only when she has to write a thesis she will be like, oh gosh, I don't know what happened that time when I was talking to so and so.

ER6: So, for ER7 and ER8, their engagement, it is more like how to slowly friendly capture the dominant discourse [...] There's a moment where ER4 was saying that, "well, ER8 you sound way too much like ER7 three years ago." Then it is kind of like the choice of how to be engaged and what is a strategy around it.

As ER4 put it, "it's more a question of your roles at different phases rather than *the* roles per se. To think that you can be embedded and always play the role of researcher is naïve." The boundaries between being a researcher, and institutional actor become increasingly blurred, forcing embedded researchers to continuously make strategic decisions about their level of engagement and critical distance. These are not one-off decisions, but ongoing, calculated choices shaped by institutional constraints and evolving opportunities—without a guaranteed outcome. This orientation reflects what feminist scholars describe as an ethics of ambiguity, where researchers act with commitment and reflexivity in contexts marked by uncertainty, complexity, and limited control. In such settings, ethical agency is not grounded in certainty of success but in a sustained effort to work from within, balancing critique with strategic alignment to enable transformative possibilities over time. The question of criticality is therefore central, and it is to this issue that we now turn.

Choosing to Keep a Friendly Distance

Embedded researchers reflect that their embeddedness was not a passive condition but a choice to remain critically engaged while fostering slow, deliberate change over decades. The risk, then, is what we refer to as "institutional capture," where researchers become absorbed in institutional maintenance rather than transformation. To sustain radical incrementalism, embedded researchers must develop the ability to anticipate co-optation risks and ensure that their incremental actions align with broader transformative goals. One researcher described their approach as staying rooted in their personal vision while strategically engaging in institutional processes. For some researchers, deliberately stepping back into an independent role becomes necessary to regain critical autonomy. This balance is particularly crucial when routine engagement limits opportunities for fresh insights and transformative impact. As ER5 elaborated:

Initially, I was positioned as a 'sustainability specialist', supporting consultants on resource efficiency and summarising sectoral sustainability gazettes for the board. In the beginning, my role was narrowly defined within the institutional 'routine', limiting my ability to challenge the dominant status quo (what was usually done in the organisation). For instance, while planning a net-zero water

strategy and implementation plan for the economic zone, my initial instinct was to inform the project community stakeholder network about the involvement of consultants and the development of the implementation plan of the zone. However, I faced resistance from some key stakeholders who preferred not to disclose every detail of the projects to the community. In contrast, I believed that keeping the community informed was essential, particularly as we were positioning the zone as a 'new' green initiative and had implications on the community.

Over time, I became more involved in community events, such as Women's Day gatherings and church activities. I began to build trust with community members. This deeper engagement, however, gradually blurred my critical distance, making it increasingly difficult to maintain an objective perspective. As I became torn between 'loyalty' to the entity or to the community. After 18 months of being embedded in the institution, I made the deliberate decision to step back and leave the organisation. This separation allowed me to critically reflect on my experiences and develop a clearer perspective from outside the institutional structure and community. By maintaining distance, I was able to reassess my role and consider how best to contribute to the sustainable transformation of the institution. (ER5)

The notion of "friendly distance" emerges as a deliberate and dynamic strategy—remaining close enough to influence institutional processes while maintaining sufficient detachment to preserve analytical independence. This is not a return to detached neutrality, but rather a purposeful recalibration of one's vantage point. Given our argument at the outset that TAR must move beyond apolitical observation toward deeply engaged, solutions-oriented inquiry, we view analytical independence not as external objectivity, but as a form of reflexive clarity—an ability to step back, assess one's position, and re-align with transformative intent. In contexts where institutional engagement "becomes routine" and "the learning curve levels off," embedded researchers must temporarily or permanently exit their embedded spaces in order to critically reflect and reorient their contributions (ER4). As ER4 elaborated:

Many of the plans hadn't materialised, and you were embedded long enough to get a sense of it, and now you're out of it. You reflect on it, and being embedded means that it will always remain with you. You gained privileged access that would have been completely impossible through traditional questionnaires or one-hour interviews or whatever. In a sense, your embeddedness job is done. Now you have to mine it, and, if necessary, go back to your connections when you need to—the relationships you formed there to fill in the gaps in your research. (ER4)

Choosing friendly distance is thus essential, though not without challenges. The possibility and act of taking distance plays a key role in sustaining analytical independence and enabling critical reflection that reconnects researchers to their broader transformative intent.

Universities, in this context, play a vital role in enabling this process where embedded researchers can “be researchers again.” As outlined in the methods, all seven embedded researchers are part of a PhD research group that meets every two weeks to discuss their research progress. These spaces encourage researchers to share their methodological tensions, including those stemming from relationship-building and role duality, reinforcing the importance of maintaining an intellectual bridge to academia. These meetings create a routinised moment of “critical reflexivity”, as researchers reflect on their positionality and receive feedback from research supervisors, peers, and academic colleagues. Additional forms of friendly distance occur through the Stellenbosch University’s Centre for Sustainability Transitions colloquium, academic writing, and participation in conferences, which offer parallel moments for distanced engagement even during ongoing embeddedness. For those permanently embedded, sabbatical leave from their institution can offer temporal space for reflection, while those in temporary embedded roles may use the end-of-project phase for the same purpose. These varied practices underscore that embedded researchers must continuously assess whether their presence is still contributing to transformation, or whether stepping back is necessary to regain perspective and realign with their critical and ethical commitments to learning and transformation. This dynamic is, of course, recursive: stepping back from engagement to reflect can be preparation for re-engaging in more effective ways within the same or a related institutional space after certain conditions may have shifted in a favourable direction over some time. The reason for this is that acting as a change agent triggers resistance. To keep pushing can be counter-productive. Allowing space and time for new learning and contradictory dynamics to unfold while retaining a watching brief may be appropriate during the course of certain processes.

From ‘Choosing’ to Being an Embedded Researcher

The lines between choosing to embed and being embedded blur, as researchers find themselves not just participating in institutional work but becoming part of it. At this stage, radical incrementalism is no longer a conscious choice but an ingrained practice, shaped by years of strategic engagement, adaptation, and persistence. The question is no longer about whether to be embedded or critical; rather, embeddedness and radical incrementalism are practiced in situ, regardless of the setting—whether within government institutions, academia, or other sectors. The following exchange, in which a researcher (ER7) questioned whether they actually had a choice in becoming an embedded researcher as a government official, illuminates a point about their embodiment that only became apparent after the collective sense-making discussions:

ER7: I didn't make choices initially, rather, I was unconscious of making choices in the context of the research component. So, does it have to be conscious all the time to say, 'OK, now I'm doing policy work, and then OK, now I'm putting in the scholarly thinking?' [...] I did contribute to the change, but the large part was during my being a policy official. My consciousness was more on the political aspect—being able to read in the room. So I was able to read in the room with a political lens of what the Ministers wanted at the time. But I was nowhere near being a proper critical researcher. [...] So in my case, it's a permanent embeddedness. [...] So I didn't have much of a choice. [...] So I wouldn't stop and

say, "okay, today I'm researching this." That's why I'm asking: Is it expected that you would decide? But when it comes to the language, I would say, "okay, this is the kind of language I could use in drafting this [cabinet document] on the basis of..." [...] In terms of the search for evidence, at least for me, it's something that is often embedded in how I make decisions. [...] But now, I am still stuck in the institution and still trying to finalise my [research] pieces.

ER4: No, you had a choice. You could have chosen not to think. [...] Yes, you're embedded by definition, but you chose to reflect. You decided to incorporate a critical component into yourself. That meant that when you participated in the [policy], you had a sense of the deeper, fundamental transformation that was necessary. But it didn't happen because the [policy] was written. You then spent the next 20 years slowly, incrementally doing your acupuncture points to shift the system in line with the original vision of transformation that you had, but you did it incrementally. [...] You could have chosen to resign and join the environmental movement, which is outside of the system. But no, you chose a difficult route. [...] you spent 20 years chipping away, chipping away, chipping away. And now, finally, there's an Act. [...] And you chose that I'm now gonna stick around one or two more years to see it gets implemented.

This exchange illustrates that when transformative visions are seamlessly integrated into everyday practice, embedded researchers need not consciously switch between scholarly and policy work. Instead, even routine tasks, such as drafting cabinet documents, can serve as opportunities to plant the seeds of radical change and continuously open up spaces for transformation. As ER7 described their gradual evolution from policy designer to policy observer and policy implementer, explaining that while their initial choices were made unconsciously, over time they began to integrate research into policy work as a deliberate strategy.

DISCUSSION

From the seven embedded research cases, it is clear that a cascade of choices is made in the real world of TAR. In many ways, choosing to combine transdisciplinary research with institutional work means choosing to enter a terrain where many consequential choices will necessarily follow. The first is choosing whether or not to be an embedded researcher. In other words, to participate in a given action field such as a social movement, political party, governance institution or action network. Once the choice is made to be embedded, then the next choice is whether or not to remain attentive to root causes and therefore on the need for fundamental transformation over the long run. If this choice is made, the power relations are such that the actions that are possible at any given moment in time are quite limited. In other words, the TAR researcher might well understand, for example, that a coal-based energy system must be replaced by a renewables-based one, but s/he works in a government entity which cannot make this happen overnight. Of course, s/he can choose to resign and mobilise wider constituencies.

The next choice will be the strategic actions that are appropriate to the context, *i.e.*, given the constraints, what can be done now that has the greatest potential to catalyse change processes that nudge the system in the right direction in ways that maybe not all actors involved fully understand. The alternative is to be embedded without understanding root causes and the need for fundamental change—this is what can lead to co-option because actions will be selected conditioned almost entirely by the constraints without realising the longer-term implications, or alternatively without envisaging how actions taken in the present could have intended or unintended consequences more conducive to more radical change. Co-option has a specific meaning here: it means participating without being critically engaged and in so doing reinforcing institutional inertia. That said, enclosed within the choice to be embedded while remaining critically engaged (*i.e.*, remaining attentive to root causes and the need for fundamental transformation) is usually, but not always, a choice between short and long term perspectives. Focusing only on what is possible in the short term is most likely going to reinforce co-option and institutional inertia, while the latter is what might well be required to be critically engaged as an embedded TAR. The challenge, however, is that embedded researchers are only rarely embedded over the long-term. During their three to four-year role as embedded researchers, they are unlikely to witness the fruits of their labour. That, however, should not prevent embedded researchers from remaining committed to the long-term goals and processes of change. Indeed, in response to the criticism that being embedded means replicating the legitimating ideology of the institution, Alain Touraine (1981), one of the founders of the movement that today we call ‘embedded research,’ argued that it means remaining committed to the highest ideals that the institution aims to achieve over the long-term. Only focusing on the short-term has the opposite effect.

Going back to the top of the cascade of choices: it is perfectly legitimate to make a choice to be critically engaged but *not* embedded based on the assumption that it is more worthwhile to generate critical knowledge that focuses on root causes and the need for fundamental transformation from a positionality located outside institutions. This can generate impactful knowledge. The danger, however, is that this kind of research can inadvertently attribute too much power to incumbents in ways that effectively eliminate the space for agents of change who are embedded and critically engaged. For example, in radical social movements there is always someone who claims to understand the *fundamental contradictions of capitalism* and why the capitalist class is so powerful and always seems ahead of the game. This kind of argument can immobilize people because they feel powerless. An alternative is to describe the contradictions, inconsistencies, and vulnerabilities of those in power so that strategies for action can be appropriately formulated by both those doing institutional work within institutions and those positioned outside the institutions. The discussion reflects some of the challenges, including the limits placed on power and institutional dynamics while the research work is taking place, implications for research ethics, and the dangers of ‘co-option’ (Hoppe, 1999; Wittmayer et al., 2024).

CONCLUSION

In conclusion, the case studies confirm the claims made by the general body of literature on transdisciplinary action research that embedded research can position researchers in ways that allow them to be both participants in change processes and analysts of the

processes/outcomes at the same time. Once the choice is made to engage in this kind of research, a cascade of choices follow that bring into focus the tension between incrementalism and transformation. The resolution of this tension lies in the notion of 'radical incrementalism,' a way of acting that connects what is possible in the present moment to potential transformative outcomes over the long run.

However, the accumulated experience that is emerging from those who have taken up this challenge is that this is not simply a better way of securing access to research subjects. The embedded researcher who is merely positioned to be a better observer is not really a truly embedded researcher. An embedded researcher is also an active participant who makes contributions in discussions/meetings, coordinates activities or drafts briefings or even writes up drafts of policy papers. In other words, s/he has to engage in institutional work. To complement the literature on transdisciplinary research that justifies the embedded researcher role, the literature on institutional work has been invoked to help make sense of the embedded researcher as an active participant in the "creating, maintaining and disrupting" institutions. Even though this literature emerged to make sense of incumbents, it is nevertheless useful for making sense of the role played by embedded researchers within institutional change.

However, returning to the core research question, being an embedded researcher engaged in institutional work means learning new skills for navigating the complex power and relational dynamics of the actual change processes they are part of. The literature on transdisciplinary action research, institutional work, and radical incrementalism that we have brought together to make sense of the case studies are not particularly helpful in preparing embedded researchers for handling these dynamics. This paper addresses this problem by drawing on the actual lived experiences of seven embedded researchers who were actively engaged in institutional work in various South African institutions.

Embedded researchers made sense of the complex power and relational dynamics by referring to four key choices: choosing to embed themselves or not within a given institution; choosing to engage and how to handle either *friendly capture* or *delaying capture*; choosing to keep a friendly but sufficient distance; and choosing to be embedded and not just to embed to better observe. This reflects on the implications of transdisciplinary research experiences in transformative institutional work for the wider action research that is the focus of the special issue. As noted earlier in the paper, we also recognise the importance of attending to unexamined dynamics of identity and power that were not fully addressed in our own reflections. Future research should build on this limitation to deepen understanding of how intersectional factors shape embeddedness and institutional engagement. ■

ACKNOWLEDGEMENTS

The authors thank the editor(s) and anonymous reviewers for their feedback. The Centre for Sustainability Transitions (CST) at Stellenbosch University, South Africa provided funding for the lead author's supervision and guidance for the post-graduate researchers.

The authors declare that no known competing financial interests or personal relationships exist. The views expressed in this paper are the authors' sole responsibility and do not necessarily reflect the views of their organisations or employers.

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Ying-Syuan (Elaine) Huang (<https://orcid.org/0000-0003-0148-6260>) is currently a Research Associate at the Faculty of Education, McGill University. Her research examines how the social sciences can contribute to just and sustainable futures by advancing ethical collaboration, institutional transformation, and collective learning. She is particularly interested in how researchers engage with the politics, evolving normativity, and uncertainties inherent in real-world change processes to serve the public good. Grounded in reflexive and relational approaches, her work reimagines knowledge production as a generative space for ethical engagement, systemic thinking, and transformative practice—both within and beyond academic institutions.

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Garth Malan (<https://orcid.org/0000-0002-4021-6151>) is a PhD Candidate in Sustainable Development at Stellenbosch University, Centre for Sustainability Transitions. His current research focuses on the water, energy, and food (WEF) nexus and how it can be operationalised on a city scale to achieve urban resource security and resilience in Cape Town. By analysing the urban metabolism of the city, his research seeks to optimise resource pathways, support synergies, mitigate trade-offs, and extend the life cycles of these resources in response to an ever-increasing demand faced with multifaceted constraints.

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APPENDIX 1

Details on the policy, political, and research contexts of the Seven Embedded Research Projects

Critical Engagements	Policy Context	Institutional work in political space	Institutional work in research space
1 Sustainable development policy formation at the national government between 2002 to 2022	Situated within the South African National Government level, which includes economic policy portfolios of departments of environmental affairs, trade and industry, economic development, science and technology, mineral resources, energy, and finance.	Technical support and bureaucratic functions in the government's evidence-informed policy change through embedding sustainability-oriented priorities from the 2008 National Framework for Sustainable Development into the 2011 National Strategy for Sustainable Development and then into the 2012 National Development Plan and the implementation of the interrelated 2024 Climate Change Act.	The research aims to understand to what extent the South African government's sustainability-oriented policies, adopted from 2002 to 2022, contribute to the dynamics of a long-term sustainability transition in South Africa.
2 Transition financing for Eskom, the state-owned energy utility, to facilitate its shift from coal-based to renewable energy generation	Situated within Eskom, a state-owned electricity utility in South Africa, as it transitions its aging coal-based power fleet. Komati Power Station has been decommissioned and repurposed for clean energy, while five more power stations face closure by 2030. The transition aims to mitigate climate change while fostering economic diversification for affected communities.	Tasked with sourcing funding for Eskom and later specifically responsible for sustainable finance, sourcing Just Energy Transition funding on wider sources, focusing on development, climate, and transition finance, and crowding in the private sector for blended solutions.	The research focuses on transition finance and its role in enabling the energy transition towards the country's net zero targets by 2050.

3 Long-term action research under the National Planning Commission, examining the investment requirements to achieve net-zero emissions	Situating within the National Planning Commission and working in collaboration with the Development Bank of Southern Africa, National Treasury and the Presidential Climate Commission. The Infrastructure Task Team of the NPC was responsible for executing the project.	Tasked with assessing the financial investment requirements to achieve net zero and energy security for all by 2050 in a country where 86% of all energy is generated by coal-fired power stations that are on average 41 years old and therefore many are due to be decommissioned.	The research work entailed (a) assembling this high-powered research partnership between 4 public institutions; (b) selecting and managing a specialist research team to do the research; (c) guiding the modelling process; (d) presenting the research to stakeholders.
4 The development of a strategic vision for a 'green' Special Economic Zone in Atlantis, Cape Town	Situating within South Africa's GreenTech Special Economic Zone (ASEZ), the work focuses on green industrialisation driven by the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Established in 2018, the Atlantis GreenTech Special Economic Zone (ASEZ) aims to be Africa's leading Greentech manufacturing hub, with investments like GRI's wind energy manufacturing strengthening its aim for localised manufacturing.	Tasked with mainstreaming sustainability into the development of the ASEZ. It involved researching and providing guidance on net-zero strategies for the zone i.e net-zero water strategies, water stewardship programmes and net-zero carbon strategies.	The research aims to examine the historical and ongoing evolution of energy sociotechnical imaginaries in Atlantis (1975–2024), analyzing how successive South African governments have shaped its development paradigm and influenced its transition toward a green future.

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| <p>5 Research on a sub-sector of South Africa's manufacturing industry, specifically exploring how infrastructure build programmes can be used to stimulate industrial revival, conducted in partnership with a manufacturing industry strategic committee (MISC),</p> | <p>The MISC is an initiative under the Department of Trade and Industry (DTIC), that is driven by members of the manufacturing industry. The mandate of the MISC is to revitalize local manufacturing amid deindustrialization by providing evidence-based industrial policy recommendations. Large public infrastructure projects are seen as a demand-degenerating opportunity for revitalizing the local manufacturing industry. As a result, the MISC is developing a strategic paper for advising on measures required for maximizing local industry participation.</p> | <p>Tasked with leading the writing efforts of the industry strategic paper on behalf of the MISC, integrating inputs from various manufacturing firms and industry experts.</p> | <p>The research aims to gain insight into the complexities, power dynamics and step-by-step processes associated with industrial policy-making from the perspectives of the industry agents that identify, craft and drive (including lobbying) policy-related directives feeding into industrial policy.</p> |
| <p>6 The creation of a decision-support tool for managing the water-energy-food nexus, developed in collaboration with the City of Cape Town and local start-up GCX</p> | <p>Responding to South Africa 2019 Resilience Strategy, a multi-institution consortium called 'Nexussing water, energy and food' was established to contribute to resilience initiatives. This involved a co-productive research process which aimed to support improved decision and policy-making.</p> | <p>Tasked with developing a tool that would facilitate the integrated management of resources. This decision-support tool is positioned as an interface between scientific methods and governance mechanisms. It aims to provide an insight and quantify the impact of sectoral actions on the wider system.</p> | <p>The research aims to develop this decision-support tool. Its development is informed by novel research and leverages the capabilities of GCX. Governance actors are engaged to ensure that the tool outputs decision-relevant information on an integrated platform, fed with live data and represented in an accessible manner.</p> |

7	The development of a non-equilibrium economy-climate-energy model, designed to assess the macroeconomic implications of the energy transition, conducted in partnership with the National Treasury, the Development Bank of South Africa, and the French Development Bank.	Responding to the Just Energy Transition policies, a multi-institution consortium was established and led by the Agence Française de Développement (AFD) Group to co-develop an out-of-equilibrium macroeconomic tool for analysing the long-term evolution of the economy in the context of energy transition and climate change.	Tasked with leading political economy scenarios of the model and contribute to the data collection, scenario building and co-authorship of the academic output of the model.	The research focuses on simulating scenarios which makes it possible to identify macroeconomic vulnerabilities and opportunities as South Africa undergoes a massive uptake of renewable energy technologies.
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