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# Five tensions in climate adaptation research

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Climate change adaptation is a maturing field of research imbued with many complexities and tensions. In this article, we outline five tensions that we observe in our own adaptation research. These are between: adaptation as a research topic and practical challenge; uncertainty in adaptation research and decision-makers' desire for certainty; the global scope of adaptation research and its highly context-specific nature; the newness of climate adaptation research and its push to address old problems; adaptation as a specialization and the need for all researchers to engage. Our aim is to encourage critical discussion and reflection among researchers about how adaptation research is positioned within, shaped by and influences social and institutional settings. Given its emplaced character, adaptation research needs to attend to its content and context.

## KEYWORDS

climate change adaptation, research, specialization, impact, academia

## 1 Introduction

Adaptation researchers need to be reflexive about their place and prospects (Preston et al., 2015) as they apply their increasingly specialized adaptation research to a variety of problems, projects and research initiatives. The special issue this article is part of maps out research priorities for climate change adaptation in light of what has been done to date, notably what is synthesized in the latest IPCC Assessment Report. In this contribution, our aim is to augment these contributions, by helping to identify not what adaptation research is needed as much as *what sort* of research is needed. One sort of research needed is that which is deft at negotiating the internal tensions that a focus on climate change engenders. By tension we mean situations in which two factors pull toward different responses that both demand attention. When neglected, tensions can inhibit research efforts by contributing to poor strategies or misunderstandings. Conversely, acknowledging tensions can foster valuable conversation, reflexivity about context, and encourage more sophisticated, effective approaches.

In this article, we outline five tensions that we encounter in our own adaptation research in Australia and the Asia-Pacific. These are between: adaptation as a research topic and practical challenge for researchers; uncertainty in adaptation research and decision-makers' desire for certainty; the global scope of adaptation research and its highly context-specific nature; adaptation as new and pushing us to address old problems; and adaptation as a specialization and something all researchers need to contribute to. These are a subjective selection of tensions and are not the only tensions that characterize adaptation research; others include the tension between urgency and caution, or the focus on reforms for adaptive governance vs. achieving immediate outcomes. The tensions we discuss are not all exclusive to climate change adaptation. The fact that climate change adaptation research faces challenges shared by other research fields underscores our argument that adaptation policy and research needs to be understood as part of wider socio-political and environmental

systems. In taking this approach, our aim is to encourage adaptation researchers to think carefully and critically about the context not only the content of adaptation research.

## 2 Five tensions in adaptation research

### 2.1 The tension between adaptation as a research topic and as a practical challenge for researchers

Climate change adaptation is not only a research topic “out there or over there” in the world, but is distinguished from many other fields by also being a lived reality for the many researchers who are being stressed and disrupted by climate change (Rickards and Watson, 2020). Direct impacts include the closure of campuses, damage to equipment, loss of library collections, reduced access to field sites, disrupted ICT and university systems, delayed peer review and publication, financial stress and redundancies, disrupted career plans and physical and mental stresses. These impacts intersect with non-climatic stressors in the research world such as the COVID-19 pandemic and the casualization of many academic workforces (Parker, 2020; Guthrie et al., 2022).

It is increasingly apparent that climate change needs to be built into research planning and practice across all disciplines, research funding organizations, universities, research teams and academies. Climate change needs to be mainstreamed into research planning, ethical protocols, and risk assessments, in ways that are appropriate and nuanced to the setting and purpose of the work. Research project management needs to encompass disruptions in empirical scope and to acknowledge uncertainty in research planning processes including projections of intended research impact (Rickards et al., 2020). For example, research funding schemes and program/project design could adopt adaptive policies and practices, including investing in longitudinal research on research itself, to better understand adaptive responses and future oriented research that embraces speculative methods, such as scenarios of possible future policy directions (Rickards et al., 2014).

Some research organizations and institutions are beginning to adapt, at least in terms of their campuses and physical assets (Kautto et al., 2018). But most remain narrowly focused on disaster response or driving research on adaptation focused on other people, communities and organizations. Few signs of climate change adaptation are evident among other elements of the research system including journals, research funders, and disciplinary associations.

Crafting research priorities and plans requires thinking about what adaptation research is needed for societies and environments to adapt to climate change and how feasible, robust or at risk different types or examples of research are, given emerging climate change constraints and challenges. The latter points to the need to adapt research practices, systems, and expectations. Indications of the sort of changes possible have arisen during the COVID-19 pandemic, with research pivoting (along with most knowledge work) to a far greater reliance on digital communication and tools. This pivot itself helps reduce the risk of transport disruptions to research, but increases exposure to infrastructural and social inequities and vulnerabilities. It is likely to influence what aspects

and parts of the world are seen, sensed and considered and so—like all aspects of research—demands critical appraisal.

### 2.2 The tension between uncertainty in adaptation research and decision-makers’ desire for certainty

As climate change profoundly alters the world, it is generating calls for data, information, innovation, training, and evaluation, to inform effective action. Policy makers, activists, CEOs, bankers, unionists are among the diverse actors turning to researchers for knowledge, guidance, and solutions, yet adaptation research reflects the uncertainties and indeterminacies that climate change introduces.

Climate change is one of the main drivers of the so-called “post-normal” turn in science, which recognizes the “irreducible complexity, deep uncertainties, multiple legitimate perspectives, value dissent, high stakes, and urgency of decision-making” and the increasing inability of science to provide firm knowledge and confident solutions (Dankel et al., 2017, p. 2). While climate change adaptation research is some of the most advanced in negotiating these demands, and is characterized by an abundance of innovative, participatory, learning oriented projects, the urgency, and practical challenges of climate change are also arguably exacerbating unhelpful aspects of the research system, such as competitiveness, short-term funding and discrete, bounded projects. In some settings this includes an increasing reliance on private research funding (Ferguson, 2022) and research bound by commercial-in-confidence agreements, stymying the sort of collective learning and public good outcomes that are needed and adding to the sense that adaptation research is only about providing immediate solutions. At the same time, the politicization of climate change has contributed to a wider decline in trust in professional and academic expertise (Marginson, 2016; Eyal, 2019), further undermining support for public research funding.

The far-reaching physical changes being generated by climate change are also destabilizing some research fields (Dankel et al., 2017). The loss of solid baselines and potential for radical, non-linear changes diminishes the capacity of research to hold the world steady enough to investigate, or to predict how certain processes will unfold and why. For example, conservation science is grappling with profound questions about what is natural and what goals for conservation are feasible and legitimate (Ross et al., 2015).

Adaptation research is among the fields facing significant intellectual challenges from climate change itself. For example, the non-stationarity of the climate change context greatly complicates efforts to identify the intended and unintended effects and the effectiveness of specific adaptation interventions over time relative to an imagined “no intervention” treatment, challenging the adaptation principle of continuous monitoring, evaluation, and adaptation of efforts. Likewise, what counts as adaptation success is highly values-based (Moser and Boykoff, 2013) and is itself liable to shift as climate change intensifies, selected adaptation pathways take hold and society alters. More broadly, adaptation priorities and associated research priorities will partly evolve in response to prior adaptation knowledge and investments, reflecting

and intersecting with similarly complex linkages between science, policy, and practice in areas like ecological restoration (Ross et al., 2015) or water resources planning (Alexandra, 2021).

How can researchers, manage this tension between escalating reliance on adaptation research and concurrent challenges to its capacity to deliver definitive answers? There are no easy answers or formulaic approaches, but one response is to offer principles, frameworks, and lessons, and to acknowledge the coproduction of science and society (Jasanoff, 2004). More broadly, there is a need to encourage broader notions of research quality that incorporate reflexive methods, public-good goals, and sophisticated outcome assessments (Nyamwanza and Bhatasara, 2015; Marginson and Yang, 2021). There is an opportunity here to apply Responsible Research and Innovation frameworks to climate change adaptation research as well as practical interventions (e.g., Simelton and McCampbell, 2021), noting that such frameworks themselves may well need adapting.

### 2.3 The tension between the global scope of adaptation research and its highly context-specific nature

Adaptation to global climate change is a part of international agendas, relevant to everyone, but also something that must be designed and implemented in ways that are grounded and appropriate to highly diverse environmental, cultural, historical, and geographic contexts. From a research perspective, a resultant tension is between approaches that seek truths that are transferrable to other contexts and problem solving, synthesis-based approaches that seek particular, context-specific knowledge (Rickards et al., 2022). Both approaches have limitations, with feminist and postcolonial scholars providing extensive critiques of universalist approaches seeking transcendental knowledge (Nightingale, 2016). Approaches to climate change rooted in global climate science can suffer from “climate reductionism” (Hulme, 2008), thereby underplaying the complexity, contingency, and the contested nature of adaptation options (Keskitalo and Preston, 2019). Similarly, the search for adaptation policy solutions with universal application is fraught. Adaptation policies seeking to extrapolate from context-specific examples or scale out a given initiative can overlook social difference, contingencies, and the practical work of implementation (Dupuis and Biesbroek, 2013). That said, approaches to climate change adaptation rooted in highly specific local contexts and particular methods or approaches are by their nature, limited. Localism without an eye to the transferrable can limit the capacity to extrapolate, share insights and scale-up action or learn from theory or work undertaken in other locations.

The tensions between localized and grounded problem solving and universal truth seeking are related to similar questions about the depth and types of adaptation. For some, climate adaptation demands transformational, not incremental change. From this perspective, conservative approaches that tweak existing systems to stabilize them are part of the problem. Yet, incremental adjustments may be warranted and appropriate in some circumstances. Small adjustment may be all that some groups can manage or want. Furthermore, stabilization may be useful for

some sites or values, such as protection of Indigenous heritage sites. Further, there are risks that large-scale transformational adaptation initiatives may be ill conceived and could be damaging, wasteful or unjust, especially if they rely on outmoded “predict and plan” models of societal change that climate change is making redundant (Mills-Novoa, 2023).

Researchers are entangled in these tensions. Perhaps the best approach is akin to what Katz (1996) calls “minor theory,” where a series of “provisional truths” are constructed as the basis for ongoing but progressive learning that remains open to different knowledges. A balance between incremental and transformational change could be sought in (adaptation) research itself, utilizing existing knowledge and methodologies when useful, but remaining alert to the need for deeper intellectual rewiring.

### 2.4 The tension between the newness of climate adaptation research and its push to address old problems

Climate change adaptation on the scale envisaged by the international community is unprecedented, which helps explain the growing research on the topic. Research in general is inherently oriented toward and attracted to novelty. Indeed, novelty is an established signifier of research excellence. When combined with the innovation bias inherent to the capitalist system (Schumpeter, 1947), there is a strong push for adaptation research to advocate new approaches. However, climate change adaptation also demands that long-standing, well-known needs are addressed. From a climate risk management perspective, this includes building in improved management of “normal” climate variability as well as improved management of climatic extremes and long-term trends (Deser, 2020). It also means investing in vulnerability reduction approaches (McEvoy et al., 2013) that aim to redress entrenched systemic inequalities and problems that drive climate change vulnerability and worsen impacts (Schipper et al., 2021). Adaptation research often reveals the structural vulnerabilities and distributional injustices that climate change is worsening for disadvantaged groups, and seeks to redress procedural and recognition injustice. Adaptation research also reveals that adaptation policies and programs are another social domain involving competition for power, legitimacy and resources (Keskitalo et al., 2012; Nightingale, 2017).

Like all research, adaptation research can suffer from the innovation bias and tend to focus on the “novel” components of a situation. While some focus on novelty is demanded by the unprecedented character of the climate change context, many of the problems that need to be addressed to reduce climate impacts are well-known, long-standing, structural ones. O’Brien et al. (2007) argue that narrow conceptualisations of adaptation problems, and their solutions, can result in narrowly specified policies. In contrast, focusing on the context of vulnerabilities enables recognition of multiple causal factors stemming from the dynamic interplay between climatic and socio-political processes (Schipper et al., 2021). Systemic risk assessments and holistic approaches to adaptation research need multiple sources of knowledge, including through participatory processes that can help redefine risks and

develop, test, and refine appropriate policy responses (Renn, 2015, 2021).

Adaptation research needs to explicitly attend to non-climatic vulnerabilities and consider how inequalities may be perpetuated through the conduct of research. Even highly technical climate risk assessments involve value judgements about what is at risk and who bears the consequences of risk management decisions (Alexandra, 2021). Researchers need to focus on the formal and informal processes and institutions of risk assessment and apply ethical principles to ensure that research does not do harm or increase exposure to risk (Lacey et al., 2015; Warner et al., 2018; Ajibade and Adams, 2019). Researchers also need to avoid the temptation of recommending that research partners or end users invest in a suite of new initiatives if they could benefit equally from improvements to existing approaches. For example, many governments have experience in disaster risk reduction and redressing entrenched vulnerabilities that arise from poverty and social inequity. Conceiving of adaptation as something novel (and an opportunity for research impact) may distract from applying a suite of proven policy instruments including those that stem from established legal principles (Chipperfield and Alexandra, 2023).

At issue here are the different norms and incentives at work in academia vs. those in the applied realm of policy making. As Findlater et al. (2021) argue in relation to climate risk management, while researchers tend to prioritize approaches that generate new data, end users may be better served by other approaches that are less interesting but support better decision-making. The upshot is the need to critically reflect on research norms, contexts, and incentives and their impacts.

## 2.5 The tension between the tension between adaptation as a specialization and the need for all researchers to engage

Adaptation is a growing area of specialization (e.g., Moser et al., 2017), with a professional association in the US American Society of Adaptation Professionals and a bevy of specialist consulting services (Keele, 2019; Findlater et al., 2021). Within academia, adaptation science is now a distinct branch of social science, represented by research centers, journals such as *Frontiers in Climate and Climate and Development*, and conferences such as *Adaptation Futures*. Various science and engineering disciplines, notably climate science, also make significant contributions.

Adaptation inside and outside of universities is interconnected. Adaptation research inside universities shapes education and training and thus the character of the emergent adaptation profession and the focus and methods of their work (see Abbott, 2010). As the IPCC, 2022 Sixth Assessment Report indicates, the dominant approach to adaptation practice remains climate risk management. This dominance reflects the climate risk management focus adopted by the IPCC which, is reinforced by adaptation research and training within universities. Within this, adaptation practice is becoming a professional specialization, with adaptation research dividing further into specializations (Sietsma et al., 2021). Such specialization has advantages including depth of subject knowledge, a shared corpus, appreciation

of historical contributions, standards and systems for quality assurance including research excellence, shared languages and agreed terminology for key concepts. It also supports translation of adaptation into areas such as law, financial regulation, water resources management, and land use sectors (McClure and Baker, 2018; Alexandra, 2021; De Sousa, 2022). However, specialization also has disadvantages. These include barriers to engagement, passivity and confusion among decision makers, and dependence on highly trained experts. Some consultancy businesses are crafting climate adaptation into a profitable market by privatizing and commercializing climate change data, knowledge, assessment methods and professional services (Webber, 2017; Keele, 2019). While consultants play many important roles in the private and public sectors, the professionalization of adaptation can encourage a profit-driven or private-good, rather than public-good, attitude to adaptation decisions (e.g., Christopher and Leung, 2015) exacerbating maladaptation risks (Barnett and O'Neill, 2010), especially for those unable to afford bespoke advice.

For research, specialization may obscure the fact that adaptation “of life today” requires a deep understanding of both climate change and “life” (e.g., Ensor et al., 2019)—and thus diverse input from across the entire academic landscape. Not only do all researchers need to adapt to climate change (as discussed above), but also all researchers can and should contribute to understanding the adaptation challenge. Cultivating ontologically, epistemologically and methodologically diverse approaches is vital to enabling us to better grasp the complexities and uncertainties of a climate-changing world. As Nightingale (2016, p. 41) argues, climate adaptation research is like a kaleidoscope with diverse approaches bringing into view different, but equally valid, patterns.

Managing this tension requires we recognize the dynamics of cross-disciplinary exchange. Research *on* adaptation is a subset of research *for* adaptation. Adaptation researchers have much to learn from connecting with researchers with expertise in the innumerable elements of the world that are at risk and need to adapt or transform, with potential for new combinations of expertise across disparate disciplines. As Abbott (2010) argues, “bundles of ties” between research groups are fluid, and can change in response to the need for new ideas and methods.

## 3 Discussion and conclusions

Climate change adaptation involves messy and evolving social processes. Acknowledging these messy complexities has broad significance for adaptation researchers, and undergirds the tensions addressed here. It means recognizing the emplaced character of research and the dynamic nature of the uncertainties of the future under climate change. Yet, as Tension 1 sets out, research is impacted and needs to adapt along with the societies and environments under investigation.

Adaptation is by definition a response to the problems of climate change and as Tension 3 argues, its global scope grates hard against the need for context specific applications. In response to the challenges, adaptation research can offer no simple or universal solutions despite any emerging sense of urgency. There are intellectual, ethical, and practical complexities to navigate. Tension 4 adds to these navigational complexities, as climate

change is additional rather than separate to the vulnerabilities and injustices that already exist.

The consolidation of adaptation into a discrete and recognizable research subject area indicates that the existing systems within the research sector are conducive to the emergence of new specializations, as discussed in Tension 5. However these systems and settings have shaped adaptation research in a particular way, but as Tension 4 argues adaptation is a contemporary academic field pre-programmed to seek novelty, establish credibility and erect boundaries. This results in the marginalization of practical judgments and a narrowing down of the way systemic problems are handled.

In scoping priorities for adaptation research, Tension 2 argues that it is important to reflect on the worldly, emplaced character of adaptation research and the context in which it occurs. Reflexive engagement of researchers is necessary given that adaptation is fundamentally a process of social learning, driven by the need for social change (Collins and Ison, 2009). Adaptation research needs to explicitly recognize this social change and learning imperatives and more actively explore creative and experimental approaches. Tension 1 also argues that research prioritization approaches needs to be critically appraised, as part of the wider social learning adaptation requires.

Conceiving of adaptation research as collective learning and experimentation within and at the boundaries of institutions helps bring to the fore assumptions about researchers' roles in a world of dynamic uncertainties, compounding risks and shifting values. We hope that this article, with its call to attend to the context as well as content of adaptation research, contributes to this task.

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## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

## Author contributions

LR and JA conceived of and designed the paper. LR, JA, and TD wrote the first draft. AS helped draft and refine the paper. All authors contributed to the article and approved the submitted version.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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