One human settlement: A transdisciplinary approach to climate change adaptation research

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ABSTRACT

The threat of climate change demands that human settlements adapt to unavoidable impacts. Climate change is a complex problem that requires traditional disciplines to work together to facilitate an integrated and coordinated response to its impacts. Transdisciplinary research approaches have been recognised for being well placed to aid responses to complex problems such as climate change. This paper draws on the experience of the South East Queensland Climate Adaptation Research Initiative (SEQCARI), Australia, to reflect upon the challenges involved in undertaking transdisciplinary research aimed at developing and improving a range of adaptation options for specific sectors as well as across sectors. Challenges and learning's are discussed based on the three phases of transdisciplinary research processes: problem framing and team building, co-creation of solution-oriented transferable knowledge, and (re)integration and application of created knowledge. Four key insights are then discussed to advance transdisciplinary research approaches for climate change adaptation: adoption of a dynamic learning approach such as learning-by-doing/doing-by-learning to provide sufficient flexibility and scope to navigate potential barriers and conflicts; selection of social sciences to drive integration; choice of one sector as a platform for integration; and acknowledgement of existing barriers and limitations associated with the political context in which the research takes place.

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1. Introduction

Even in the event of aggressive climate change mitigation efforts, some degree of climate change is unavoidable, necessitating adaptation (Agrawal, Lemos, Orlove, & Ribot, 2012; Solomon et al., 2007). Climate change impacts and adaptation responses transcend disciplinary boundaries that underpin the structure and functioning of many research enterprises, are intertwined with socio-political context as well as biophysical variables, and require the participation of stakeholders to produce socially acceptable outcomes (Carew & Wickson, 2010). Furthermore, climate change adaptation

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has transformed from a purely scientific concept to a highly relevant socio-political and economic challenge with a high degree of complexity (Carolan, 2004; Solomon et al., 2007). Global issues such as climate change tend to be abstract, making them 'epistemologically distant' (Carolan, 2004). Thus, climate change adaptation challenges researchers to work in ways that breach traditional disciplinary boundaries to include many different perspectives, methods and disciplines (Carew & Wickson, 2010; Deppisch & Hasibovic, 2013).

These characteristics of climate change adaptation, as well as its inherent complexity and hybrid nature, has led researchers to advocate for transdisciplinary approaches to adaptation-related research and policy development (Deppisch & Hasibovic, 2013; Mauser et al., 2013; Parry, Canziani, Palutikof, van der Linden, & Hanson, 2007; Popa, Guillermin, & Dedeurwaerde, 2014). Specifically, it is argued that transdisciplinary approaches are critical for research that deals with complex ill-defined problems concerning human–environment interactions such as climate change that require 'collective leadership, complex collaborations, and significant exchanges among scientists, decision makers and knowledge users' (Gosselin, Bélanger, Lapaige, & Labbé, 2010).

While there is much literature covering transdisciplinary research approaches related to sustainability science [see for example Brandt et al., 2013; Lang et al., 2012; Mauser et al., 2013; Pohl, 2008] and health and medical science (Hall et al., 2008; Lawrence, 2004), fewer publications deal specifically with climate change adaptation (Deppisch & Hasibovic, 2013; Rice, 2013). In this paper, we aim to contribute to the emerging field of transdisciplinary research for climate change adaptation by drawing on the experience, challenges and learning's encountered by the South East Queensland Climate Adaptation Research Initiative (SEQCARI).

The SEQCARI project was one of the first comprehensive regional studies on climate change adaptation undertaken in Australia to address the challenges of climate change in the South East Queensland (SEQ) region – a recognised climate change 'hotspot' due to its coastal location and ongoing population growth (Crick, Serrao-Neumann, Low Choy, Sano, & Baum, 2012; Hennessy et al., 2007). The project aimed to examine SEQ's vulnerability to climate change and to develop adaptation strategies to assist decision-makers in government, industry and the community. The project involved four research institutions and covered a range of themes, including human settlements, downscaling of global climate projections, biodiversity, adaptive capacity, agriculture, energy and large scale infrastructure projects (McAllister et al., 2014). This paper reports on the Human Settlements component of SEQCARI which comprised a three-year integrated multi-sectoral study of climate change adaptation options for human settlements in SEQ examining the interrelated sectors of urban planning and management, coastal management, human health, emergency management, and physical infrastructure at the local government scale.

This paper aims to contribute to informing transdisciplinary research by providing a self-reflection on the Human Settlements component of SEQCARI. Specifically, we focus on the challenges involved in developing a range of adaptation options (including policies, practices and procedures) in each specific sector as well as across sectors, for better management of anticipated climate change impacts. In doing so, the paper discusses the nature of these challenges in relation to:

- Coordination of discipline and sector investigations and analysis;
- Cross-fertilization of data and findings across disciplines and sectors; and
- Synthesis of outputs, especially adaptation options across disciplines and sectors.

2. Transdisciplinarity and climate change adaptation

While discourse about transdisciplinarity emerged in the early 1970s, debate continues amongst scholars about what transdisciplinarity actually means and how it can be applied and accomplished in research enterprises (Balsiger, 2004; Jahn, Bergmann, & Keil, 2012; Pohl, 2008). Evolving discussions on the concept of transdisciplinarity suggest that it includes concerns that transcend and go across and through disciplines, and 'beyond each individual discipline' (Alvargonzález, 2011). In the research context, transdisciplinarity comprises a research approach that deals with real world problems where solutions cannot be found in existing discipline-based knowledge but require links across specific knowledge to deal with inherent problem complexity and devise appropriate responses (Alvargonzález, 2011). It seeks to achieve this by having goals that are responsive to the problem context and stakeholders and by engaging literature and theory across a broad range of disciplines (Horlick-Jones & Sime, 2004; Wickson, Carew, & Russell, 2006).

Transdisciplinary research involves the active engagement of stakeholders representing different sectors and worldviews in the processes of problem identification, knowledge production and learning (Angelstam et al., 2013). It aims to take into account the complexity of the issues and problems it seeks to address and balance the diverse interests and inputs of stakeholders and disciplines in the pursuit of practically relevant knowledge (Angelstam et al., 2013; Carew & Wickson, 2010). These elements of transdisciplinary research have been well articulated by Jahn et al.'s (2012) definition which states that:

> "*Transdisciplinarity is a critical and self-reflexive research approach that relates societal with scientific problems; it produces new knowledge by integrating different scientific and extra-scientific insights; its aim is to contribute to both societal and scientific progress; integration is the cognitive operation of establishing a novel, hitherto non-existent connection between the distinct epistemic, social–organisational, and communicative entities that make up the given problem context.*" (pp. 8–9)