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Charting the emergence of a 'knowing system' for climate change adaptation in Australian regional natural resource management

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ABSTRACT

Climate change increases the complexity and uncertainty of regional natural resource management (NRM), calling into question the appropriateness of linear knowledge-transfer approaches. In this paper we reflect on knowledge practices among a partnership of researchers and NRM planners, under a federal program of NRM investment intended to 'deliver information' to regional NRM planners to support planning for climate change. We unpack 'container' and 'conduit' metaphors of linear, one-way communication invoked by the starting conditions, and explore whether more relational ways of communicating were achieved. A key theme emerged early in the research that NRM planners felt overwhelmed by the sheer volume of information available and discouraged by the irrelevance of much of it to their climate change planning. Our research-practice collaboration unfolded in this context and through ongoing face-to-face and virtual engagement over a period of two years. The collaborative approach featured joint identification of priority activities, co-design of planning approaches, and the iterative co-development of an online 'information portal', which acted as a boundary object. We report the emergence of a 'knowing system', resulting from these efforts to foster relationships and co-produce boundary objects in a particular geographic context. Our findings highlight the potential benefits of investing in the capacity of researchers and NRM practitioners to engage in collaborative research partnerships premised on the emergence of knowing systems.

1. Introduction

Natural resource management (NRM) in Australia is partly underpinned by a discourse of ecological thinking; that is, a commitment to holism and the interconnectedness of natural systems, and a reliance on comprehensive thinking to guide action (Ulrich, 1993). Investing in scientific information to reducing risk and uncertainty is only one input to policy and planning (Head, 2014). Rational NRM planning processes involve determining what is scientifically understood about the functioning of ecosystems and the impacts of human activities, and then applying this information through management strategies. One consequence of this rationality is that it constrains the ability to act, as uncertainty increases the further into the future we plan (Rittel, 1972). Therefore the high level of complexity of natural and human systems means that strategies based on applying rational planning based on fixed forms of knowledge are likely to be short-term and narrowly-focused.

Added to this is the complexity and difficulty of managing landscapes for ecological outcomes. For example, Lindenmayer et al. (2008) emphasise that conservation planning is usually performed in the absence of goals. Not only because visions of future landscapes and ecological restoration are highly contested (Trigger et al., 2008), but also because the pathways of restoration are lengthy and their impact on the resilience of natural systems is largely unknown (Lake, 2013). In the absence of functional goals for restoration, NRM planning tends to focus on maintaining current condition, or slowing further degradation.

Australia has a multi-scalar NRM governance regime (Morrison, 2007), where federal and state governments who set policy, coordinate, and invest in regional and local planning and management. With the shift to regional 'delivery' of federal and state responsibilities and funding, planning is being done within an increasingly complex set of institutional arrangements (Lockwood et al., 2009; Lockwood and Davidson, 2010; Wallis and Ison, 2011), and the resources to deal with it are often scarce (Robins and Dovers, 2007). Benham et al. (2015)

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reported that project-based and issue-focused funding structures can constrain the ability of NRM planners to engage in collaborative relationship with stakeholders over sufficiently long time periods. Despite two decades of mixed success with the regional delivery model (Curtis et al., 2014), NRM governance in Australia remains problematic, with contestation between federal, state, regional and local levels over setting priorities, investing resources and fostering the capacity to implement actions. In a broader policy context, many of the issues that NRM planners tackle are frequently framed as highly complex and intractable (Coffey, 2014), or even 'wicked' problems (Ison et al., 2015; Rittel and Webber, 1973) that have no immediate solutions.

Finally, the recognition that the 'stationary' basis of much planning and management is 'dead' (Milly et al., 2008) and the increasingly apparent impacts of climate change add another layer of difficulty to NRM planning, not just for current landscapes but also for unknown future landscapes. There is not only substantial risk in future climate impacts, but also uncertainty, ignorance, ambiguity and indeterminacy (Stirling, 2012). These are influenced by political factors across scales (e.g. strength of mitigation efforts and degree of resourcing for regional NRM activity), climate model agreement, and lack of understanding of ecological dynamics and drivers (phenology, extreme weather events) and their effect on natural systems.

Given widespread recognition of complexity and uncertainty in planning, it is remarkable that the linear model of knowledge transfer (Ison and Russell, 2000) and rational-technical planning approaches remain prevalent in the design and implementation of NRM programs, including those focused on responding to climate change. For example, the Federal Government's *NRM Planning for Climate Change* program was designed to support regional NRM organisations with one stream of funding to prepare climate change plans, while a second stream of investment provided updated regional climate change projections and supported:

> "research institutions to work with regional NRM organisations to deliver information on climate change, its impacts and potential adaptation responses, and provide guidance on how to use that information in NRM planning."
>
> Department of the Environment, 2014

The intent of this statement can be interpreted in different ways, in particular the direction to 'deliver information', with the supplementary directive to 'provide guidance'. In examining the relationship between knowledge and practice, other authors have proposed that 'knowing' arises from applying knowledge in practice, and that practice and context also influence how we understand knowledge (Cook and Wagenaar, 2012; Lave and Wenger, 1991). Taking a starting point that all knowledge is situated and embodied (Haraway, 1988), and that "all work takes place in a context" (Wagenaar, 2004, p. 648), or a particular set of relations, NRM planners are always acting and knowing, individually and collectively, in response to new situations (e.g. Edwards and Gill, 2015). However, this raises the question of what sort of relations are involved and how do they constitute the knowledge, or knowing as a sense-making process? As Maturana and Varela (1992, p. 248) write "knowing is doing…and every human act takes place in languaging", thus one possibility is that NRM governance can be enhanced through the cultivation of 'knowing' in NRM planning praxis.

Systems thinking and practice, which informs our research practice, focuses on interactions and dynamism among social and biophysical elements, and tends to be oriented more by verbs than nouns, thus our use of 'knowing' rather than 'knowledge'. As Nicolini et al. (2003, p. 3) argue, "knowing precedes knowledge, both logically and chronologically" and is situated in practices. However, Bengson (2013) points out the contested philosophical nature of 'knowing-how' (e.g. knowing how to plan for climate change), versus 'knowing-that' (e.g. knowing that climate change impacts NRM in certain ways). There are only a limited number of studies specifically on 'knowing' in the vast literature on knowledge management, knowledge transfer, knowledge translation, knowledge brokering, knowledge mobilisation, and even the catch-all K* (KStar) concept (Shaxson et al., 2012). Here we examine some examples of 'knowing' in NRM.

In research from an international development context, Engel and Salomon (2002) claimed that a 'knowing system' captured elements of both learning and doing, and define one as "a set of actors involved in knowing their way into a particular future" (Engel and Salomon, 2002, pp. 50–51). In governing 'knowing for development', they made several suggestions, including but not limited to: fostering a joint capacity for collective knowing, focusing on a geographic region (e.g. a catchment), constructing a platform or identity, agreeing on some governance principles, and developing some guiding metaphors throughout the process.

Bawden (2007) depicts the concept of a 'knowing system' as a subsystem of a learning system (e.g. Collins et al., 2009). Learning and knowing, Bawden (2007) claims, are linked in a systemic framework that can potentially be enacted as a group of people in a 'knowing system', who are aware of how they approach a situation, and bring critical reflection to their own thinking and practice. Others argue that learning-based approaches need to be adopted and boundaries expanded from natural biophysical systems to social-biophysical systems (Armitage et al., 2009; Collins and Ison, 2009; Ison et al., 2007). Collins et al. (2009, p. 364) interpret social learning as a set of process, including "change of behaviours and actions resulting from understanding something through action ('knowing') and leading to concerted action".

The normative aim of our research and practice was to develop approaches and capacity to perform climate change planning for NRM. One element of this involved facilitating the development of capacity across researchers and NRM practitioners to engage in a process of joint inquiry into how information about potential climate change impacts on natural systems could be most effectively utilised for climate change adaptation planning in NRM. Our approach was to form a collaborative partnership that favoured discovery of information, rather than delivery, in ways that would encourage interaction, sharing and participation, and that would draw attention to the influence of problem framing (Fünfgeld and McEvoy, 2011; e.g. Hoppe, 2011) on NRM planning.

The aim of this paper is to reflect on the scoping, activities and outcomes of the research partnership and explore whether we effectively broke out of linear knowledge-transfer traditions. We use Krippendorff's (1993) metaphors of communication as potential indicators of the nature of the relationships that developed between researchers and NRM planners over time. We consider whether a 'knowing system' emerged and explore some of the implications for the ongoing implementation of adaptation planning in NRM and the role that knowing systems can play in sustaining ongoing research-practice collaboration.

2. Methodology and conceptual framework

Our research inquiry, spanning early-2013 to mid-2016, was based on a project entitled *'Climate Impacts and Adaptation Planning for Southern Slopes NRM Region'* carried out by a collaboration of university researchers and public service staff called *Southern Slopes Climate Change Adaptation Research Partnership* (SCARP, referred to here as the 'research partnership'). The research partnership was located in south-eastern Australia and included representatives from a 'cluster' of nine regional NRM organisations, three state government departments, and five universities. The area of land managed by agencies involved in the partnership was approximately 23.4 million hectares. The total number of participants was 26, comprising 9 NRM planners, 4 primary researchers and 3 research support staff, 4 staff from state governments, and 6 members of a project steering committee from research, state governments and regional NRM planners. Eight clusters in total covered the broad expanse of Australia's NRM regions, though each cluster