Environmental Science & Policy

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Collaboration mobilises institutions with scale-dependent comparative advantage in landscape-scale biodiversity conservation

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ARTICLE INFO

ABSTRACT

Landscape-scale approaches are emerging as central to ecosystem management and biodiversity conservation globally, triggering the requirement for collaboration between multiple actors and associated risks including knowledge asymmetries; institutional fragmentation; uncertainty; power imbalances; "invisible" slow-changing variables; and entrenched socio-economic inequities. While social science has elucidated some dimensions required for effective collaboration, little is known about how collaboration manages these risks, or of its effects on associated social-ecological linkages. Our analysis of four different Australian contexts of collaboration shows they mobilised institutions matched to addressing environmental threats, at diverse scales across regulatory and non-regulatory domains. The institutions mobilised included national regulatory controls on development that threatened habitat, incentives to farmers for practice-change, and mechanisms that increased resources for on-ground fire and pest management. Knowledge-sharing underpinned effective risk management and was facilitated through the use of boundary objects, enhanced multi-stakeholder peer review processes, interactive spatial platforms, and Aboriginal-driven planning. Institutions mobilised in these collaborations show scale-dependent comparative advantage for addressing environmental threats. The findings confirm the need to shift scientific attention away from theorising about the ideal-scale for governance. We argue instead for a focus on understanding how knowledge-sharing activities across multiple scales can more effectively connect environmental threats with the most capable institution to address these threats.

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1. Introduction

Ecosystems and biodiversity need to be managed and conserved at the landscape scale to ensure the provision of many services including freshwater, climate regulation and habitats for species of both commercial and conservation value (Prager et al., 2012). Landscape-scale biodiversity conservation approaches are gaining recognition as key tools alongside, or alternative to, species-focused and protected

area methods (Wyborn and Bixler, 2013). The move to broader scales requires collaboration between multiple social actors and integration of knowledge about diverse social components (values, culture, communities, households, technologies, markets) together with multiple ecosystem components (wind, water quality, fires, habitat distribution, species populations) that vary spatially and temporally (Ommer et al., 2012).

The drivers and effects of multiscalar collaboration in landscape-scale biodiversity conservation and management are receiving increasing scientific attention, including through systematic typologies to help interrogate the diversity of contexts (Hill et al., 2012; Robinson et al., 2011). Effective social conditions for collaboration have been shown to be supported by authentic dialogue between diverse stakeholders who have interdependent interests in particular issues or planning contexts (Innes and Booher, 2010). Severe, complex environmental problems often create the social conditions for collaborations to form because the benefits of working together outweigh the transaction costs, provided there is appropriate leadership, social and human capital and access to funding (Benson et al., 2013). Relational dynamics within collaborators' social networks are key to effective learning (Lejano and Ingram, 2009). However, the linkages between the social conditions of collaboration and environmental outcomes have been little investigated and remain unclear (Plummer et al., 2012; Wyborn and Bixler, 2013). In Australia, where environmental management has substantially relied on collaborative approaches over the last two decades, a recent review identified a continued decline in environmental conditions and highlighted the need for better understanding of the impacts of collaboration on environmental institutions and conditions (Jacobson et al., 2014). In this paper, we present an Australian multi-case study analysis, based on a social-ecological systems approach, of how collaboration manages risks that are triggered by landscape-scale approaches to biodiversity conservation. Our analysis highlights the capacity of collaboration to mobilise institutions that have *scale-dependent comparative advantage* for biodiversity conservation. We also found some evidence that mobilising these institutions slowed the rates of biodiversity declines, which nevertheless continues.

Proponents identify the strengths of collaboration as: producing more informed, creative, and adaptive solutions; building individual and social capacity; achieving consensus, thereby avoiding costly disputes; supporting processes for shaping and implementing regulatory policy; and improving social and environmental outcomes (Susskind et al., 2012). Critics argue that collaboration: delegitimizes legal institutions for resolving conflict; co-opts environmental advocates; dis-empowers national and international conservation interests; impedes recognition of the rights of Aboriginal peoples; entrenches socio-economic marginalisation, and produces lowest common denominator solutions (McKinney and Field, 2008; von der Porten and de Loe, 2013). Innes and Booher (2010) concluded from their multi-decadal study that the overall impact of effective collaboration is to produce long-term social and institutional learning that promotes systemic adaptation. Linkages with social-ecological systems (SES) science offer pathways to extend this understanding by also focusing attention on environmental considerations (Wilkinson, 2012).

SES science emphasises the dynamic and interactive aspects of people-environment relationships and features such as non-linearity, cross-scale interactions, linkages amongst fast and relatively slow changing variables, thresholds and surprise (Folke, 2006). It focuses primarily on promoting sustainability. Attention to collaboration has arisen from recognition that participation builds trust, and deliberation leads to the shared understanding needed for self-organization and for connections across polycentric decision making nodes, enabling ongoing adaptive governance for sustainability (Lebel et al., 2006). SES analysis has proposed that collaboration enables solutions to sustainability issues such as climate change through a *risk management* approach (May and Plummer, 2011). Particular risks triggered in landscape-scale biodiversity conservation include: knowledge asymmetries; institutional diversity and fragmentation; uncertainty; power imbalances; "invisible" slow-changing variables (e.g. incremental habitat loss, erosion of inter-generational knowledge transfer); and entrenched socio-economic disadvantage and marginalisation (Pert et al., 2010). Mauelshagen et al. (2014) demonstrate that effective risk management in environmental policy-making requires systematic knowledge management to enable traditional vertical knowledge dissemination to be supported by more effective lateral knowledge-sharing. SES analyses have also proposed that the management of power imbalances through collaboration can mobilise connections between knowledge and social learning that produce *generative power*, a potent channel for structuring social-ecological system change towards sustainability (Hendriks, 2009; Hill et al., 2013).

These propositions regarding the effect of collaboration on risk management and power relations, and the recognised potential of SES science to elucidate social-ecological linkages, underpin our approach to understanding how collaboration supports institutions for biodiversity conservation. We used a common enquiry framework to analyse four Australian case studies of collaborative environmental management. The framework enabled investigation of six dimensions of risk and outcomes for biodiversity conservation institutions from landscape-scale collaborations. In this paper, we firstly present our methods for data collection, analysis and synthesis, followed by a description of the biodiversity and institutional context, and start-up processes for each of the case studies. We then present the results of our analysis, and discuss the significance and implications of our research findings.

2.   Methods

Our research used the techniques of multiple cross-case study synthesis (Yin, 2009), applied to investigate four cases that were originally conducted as independent research studies. These prior studies had engaged one or more co-authors as research leaders or team members in multi-stakeholder collaborations for landscape-scale biodiversity conservation. Eleven prospective studies were initially identified from diverse social-ecological contexts, mainly in northern Australia (Table 1, Fig. 1).

Comparative analysis involved four stages (Fig. 2). First, eight researchers who had been involved in each of the 11