



Analysis

Is Adaptive Co-management Delivering? Examining Relationships Between Collaboration, Learning and Outcomes in UNESCO Biosphere Reserves



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ABSTRACT

This paper examines relationships among perceived processes and outcomes in four UNESCO biosphere reserves (BRs). BRs offer a unique opportunity to examine these relationships because they aim to foster more adaptive and collaborative forms of management, i.e. adaptive co-management (ACM). Accounting for the outcomes of ACM is a difficult task and little progress has been made to this end. However, we show here that ACM efforts in all four BRs had a myriad of positive results as well as ecological and livelihood effects. Process variables of collaboration and learning explained over half (54.6%) of the variability in results and over one third (35.1%) of the variability in effects. While the overall models for outcomes and subsequent process were not significant, the regressions revealed predictive potential for both process variables. Our analysis highlights that a better process is associated with more positive outcomes and that collaboration and learning make unique contributions to outcomes. Opportunities for quantitative techniques to be utilized in understanding the dynamics of ACM are illustrated. Understanding relationships between process and outcomes (and vice versa) provides a sound basis to answer critiques, enhances accountability, and maximizes the potential of positive impacts for ecosystems and humans.

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1. Introduction

Understanding the impacts of different resource management and environmental governance interventions is inherently difficult. [Guerry et al. \(2015\)](#) observe that: data is often incomplete, inadequate and costly to collect; program impacts require comparative conditions, often at landscape scales; policy impacts are complicated by confounding factors, lag times and complex feedbacks; and, attribution of impacts from interventions are made via complex, often incomplete, and not entirely understood causal links. Indeed, research related to several emerging approaches to resource management and environmental governance has emphasized a need for evaluation. For example, evaluation was a general void in co-management ([Plummer and Armitage, 2007a](#)) and rare in collaborative planning ([Chess, 2000](#); [Bellamy et al., 2001](#); [Frame et al., 2004](#)). Evidence-based appraisals are needed to reconcile rhetoric with reality in regards to community-based management ([Kellert et al., 2000](#)), collaboration ([Conley and Moote, 2003](#); [Bryan,](#)

[2004](#); [Frame et al., 2004](#)), co-management ([Nadasdy, 2003](#); [Natcher et al., 2005](#)), and participatory approaches more broadly ([Schultz et al., 2011](#)). Appraisals in a contemporary context should also be informed by our understanding of complex adaptive systems, which draw further attention to cross-scale effects, emergent outcomes and self-organization (e.g., [Campbell et al., 2001](#); [Connick and Innes, 2003](#); [Plummer and Armitage, 2007a](#)). Positioned in this way, monitoring and evaluation of management and governance approaches is imperative for learning and adaptation ([Bellamy et al., 2001](#); [Plummer and Armitage, 2007a](#); [Guerry et al., 2015](#)), and learning, in turn, is a critical ingredient in preparing for transformational change ([Butler et al., 2016](#)).

Adaptive co-management (ACM) is one approach that has gained considerable attention among scholars and practitioners, and that is a particular focus of this paper. There are over 100 publications on the approach from the time it first appeared in 1997 to 2010 ([Plummer et al., 2012](#)). ACM has been applied globally as an approach to address a variety of environmental and resource challenges – forestry, fisheries, wildlife, parks and protected areas, wetlands, and climate change adaptation. The instrumental rationale for ACM is sustainability and social-ecological resilience: it aims to address environmental challenges through a collaborative and learning-oriented place-based process,

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and thereby bring about ecologically sustainable livelihoods (Plummer and Armitage, 2007a; Folke et al., 2005; Armitage et al., 2007; Schultz, 2009).

ACM is both a prescription (i.e., a suggestion) for how to accomplish desirable environmental governance, and a real-world phenomenon in that many governance initiatives have emerged that more or less closely align with these prescriptions (Olsson et al., 2004; Schultz et al., 2011). Berkes et al. (2007) have, for example, observed that initiatives that apparently are adhering to the basic principles of ACM establish horizontal and vertical linkages for shared learning among actors, take place over a medium to long temporal periods, and operate across scales and levels. Such governance features have subsequently been incorporated in the conceptualization of what constitutes ACM (Plummer and Armitage, 2007b; Plummer et al., 2012). Since it is largely an evolving concept (a “moving target”), it becomes even more critical to empirically examine the claims about its ability to accomplish desirable outcomes. If not, ACM risks becoming a largely “ideological” construct, rather than an empirically tested approach.

Many different claims exist in parallel about what ACM can deliver. A clear tension is evident between enthusiasm for ACM and critiques of its outcomes (Plummer and Armitage, 2007a; Cox et al., 2010; Cundill and Fabricius, 2010). On the one hand, ACM is identified as having promise to: build adaptive capacity (Armitage, 2007; Fabricius et al., 2007); address the ‘issue of fit’ between institutions and biophysical systems (Olsson et al., 2007; Galaz et al., 2008); and, nurture resilience for sustaining “...complex social–ecological systems” (Olsson et al., 2004:87; see also Folke et al., 2005; Berkes et al., 2007; Schultz, 2009). On the other hand, ACM has been roundly critiqued. For example, Nadasdy (2007) questions the ‘gospel’ of resilience, and adaptive co-management, for reinforcing existing inequities by not addressing broader aspects of political economy. Gondo (2011), based on a Delphi study of researchers in South and East Africa, observes problems of effectiveness being conflated with success, conceptual ambiguities leading to (mis-)interpretations, such as abdication of responsibilities, and top-down imposition weakening community governance and/or reinforcing powerful interests.

As a response to these ambiguities, a systematic review of the ACM literature up until May 2010 was undertaken (see Plummer et al., 2012). The objectives were in part to better understand the issue of outcomes and successes (and failures) as well as their relationships to aspects of the different factors that constitute an ACM process (see Plummer et al., 2012). After comprehensively investigating > 100 published works, they concluded that “the diverse conceptualizations of these factors and general lack of operational measures to assess their contribution to outcomes make it impossible currently to derive robust conclusions from experience accumulated with ACM to date” (Plummer et al., 2012: online). Gaining empirical evidence of outcomes through the evaluation of ACM is necessary (Cundill and Fabricius, 2010; Lundmark et al., 2014; Trimble et al., 2015) and it must be done in a consistent and systematic manner (Plummer and Armitage, 2007a; Cox et al., 2010; Plummer et al., 2012; Butler et al., 2015). The benefits of monitoring and evaluation extend to the ACM process itself, as these activities contribute to a learning feedback loop (Plummer and Armitage, 2007a, 2007b; Butler et al., 2015; Butler et al., 2016).

To address this gap, this study has two aims. First, to more closely examine the causal links between two cornerstones of ACM that re-occur in all related studies and conceptualizations, and a series of social and ecological outcomes. These cornerstones are (i) different actors and stakeholders coming together and interacting in **collaboration** towards an environmental-related aim, and (ii) the **learning** this ideally brings about. Bringing together collaboration and learning is indeed the hallmark of ACM (Folke et al., 2005; Armitage et al., 2007; Plummer et al., 2012; Plummer et al., 2014; Fabricius and Currie, 2015). Furthermore, since ACM is posited as a continual process where outcomes create pre-conditions for the process to continue, the second aim of this study is to probe the relationships between these outcomes and future

processes of collaboration and learning. Four biosphere reserves (BRs) designated under the UNESCO-Man and the Biosphere Programme provide the empirical setting in which the study occurred. This programme was established to build a series of learning sites where biodiversity conservation, sustainable development, and research and training are promoted. These sites can be seen as natural experiments with ACM because UNESCO recommendations include adaptive management and participation of a range of suitable actors (Schultz et al., 2011).

2. Methods

2.1. Conceptual Orientation and Guiding Framework

Our investigation of outcomes is guided by the resilience-based framework for evaluating ACM (Plummer and Armitage, 2007a). There are multiple reasons for this choice: social-ecological resilience and sustainability as the instrumental rationale for ACM is made explicit; the framework is cast from the complex adaptive systems worldview; it is designed to facilitate multi-site comparisons and encourages adapting higher order parameters to focus the particular evaluation at hand; and, it has informed much of the evaluative research in ACM thus far (e.g. Smedstad and Gosnell, 2013; Trimble et al., 2015; Butler et al., 2015).

Fig. 1 illustrates our guiding conceptual framework, and reflects three general areas of focus:

- The instrumental rationale of ACM is social-ecological resilience and sustainability (Folke et al., 2005; Armitage et al., 2007; Plummer and Armitage, 2007a; Plummer et al., 2014). As shown in Fig. 1, it is anticipated that the ACM process will lead to outcomes. Hence, the first question is: *what outcomes arise from ACM in the BRs?* In following the work of Plummer and Armitage (2007a) and Plummer et al. (2014), outcomes are manifested as results and effects. *Results* are the products (tangible and intangible) that arise immediately from the initiative (first order) or indirectly (second order) (see Innes and Booher, 1999 for the original typology). *Effects* are their consequences, and are considered in terms of ecological or livelihoods contributions. While there are different terms used to capture outcomes in the natural resource management literature, for example outputs, outcomes and impacts (e.g., Mandarano, 2008), the terminology chosen for use here reflects the need to use systematic and clear concepts to overcome past limitations of ACM research (Plummer et al., 2012).
- ACM brings together and builds upon collaboration and learning (Folke et al., 2005; Armitage et al., 2007), as shown in Fig. 1. The materialization of outcome(s) from ACM is represented with the straight blue arrow in Fig. 1. Predicated upon the assumption that ACM leads to outcomes, the second question then arises as to *how ACM relates to outcomes?* This is a complicated matter. It necessitates examining the relationships between ACM, constituted mainly by the processes of collaboration (collaborative qualities and networks) and learning, and outcomes, constituted by results (first order tangible, first order intangible, second order) and effects (ecological and livelihoods).
- As ACM is an ongoing and iterative process (e.g., Colfer, 2005; Armitage et al., 2007; Plummer, 2009; Plummer et al., 2014), it is logical to next ask, *do outcomes influence future ACM process in the BRs?* The blue arrow at the bottom of Fig. 1 shows the possibility of such a feedback loop. Discerning the presence and nuances of it requires examining each of the relationships associated with the second question from the opposite direction while including a temporal dimension.

Finally, it is important to be clear about the nature of variables being investigated in this research. For simplicity, we will from here on refer to the key variables of focus in this study - collaboration and learning - as the ACM process. We believe this is an acceptable approach but acknowledge that our operationalization of these variables does not fully

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