



Policy indicators for use in impact evaluations of protected area networks



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ABSTRACT

The number of protected areas (PAs) has steadily increased in the past 20 years, but their effectiveness to meet conservation targets is consistently questioned. Most conservation impact evaluations of protected areas assume that formal designations, like that of IUCN categories, reflect site-specific conservation rules, but this is not always true. In this paper we illustrate how conservation rules could be empirically assessed by use of content analysis combined with optimal scaling. This flexible methodology allows us to quantitatively assess strictness levels for use in conservation impact evaluations. The strictness measures could also indicate whether conservation rules are consistently applied in the different IUCN categories thereby providing guidance for future assignment of PAs to the IUCN protected area management categories. We illustrate how policy indicators based on conservation rules could be developed in two contrasting mountain protected area networks in Norway and in British Columbia (BC), including a total of 48 PAs in Norway and 51 in BC. Conservation rules for recreational use, motorized access and resource use were quantitatively assessed, thus providing a measure of how strictly PAs regulate the different human activities. Our results show that the main differences in strictness are between the two countries, followed by the contrast between national parks and provincial parks in BC. Overall, Norway has a more liberal conservation policy than BC and older national parks in BC have a much stricter conservation policy than most of the other PAs in this study. Overarching conservation objectives did not reflect the level of strictness (the conservation rules) that guide the daily management of individual PAs. This applies to both countries. We recommend to empirically investigate site-specific conservation rules to include *de facto* management of human activities in conservation policy impact evaluations. The methodology is also useful for monitoring downgrading of the protected area status, which is a result of authorizing human activities that are not consistent with conservation objectives.

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1. Introduction

Protected areas (PAs) have long been the cornerstone for preserving biodiversity, ecosystem services and other global environmental benefits (Chape et al., 2005). Despite the increase in numbers and coverage of PAs, the world's biodiversity and other ecosystem services continue to decline, also within park boundaries (Geldmann et al., 2013; MacKinnon et al., 2015; Pressey et al., 2015). The 10th Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) adopted a new Strategic Plan for Biodiversity 2011–2020 including what is commonly known as the 20 Aichi targets. Aichi target 11 states:

“By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes” (CBD, 2010).

Aichi target 11 acknowledges that area coverage is not sufficient for halting biodiversity declines. Many of the world's PAs offer weak protection against the human activities that cause the declines of biodiversity and ecosystem services (Leverington et al., 2010; Watson et al., 2014). There is therefore a growing awareness of the need to invest more in the design and management of protected area networks.

A key question that has surfaced in global impact evaluations of PAs is whether strict versus multiple use PAs are more effective at protecting biodiversity and ecosystem services (Ferraro et al.,

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2013; Nolte et al., 2013). Strictly protected areas that permit few extractive uses and where access is limited have long been argued as necessary for achieving conservation targets (e.g. Hilborn et al., 2006; Locke and Dearden, 2005; Terborgh, 2004). Others maintain that more inclusionary approaches like community-based conservation that allow sustainable use in PAs could be more effective at meeting both conservation and development objectives (e.g. Berkes, 2004; Nelson and Chomitz, 2011; Tallis et al., 2008). The proponents of multiple use PAs argue that less strict protected areas could reduce conflict levels, increase compliance and lower the costs of overall enforcement. Permitting sustainable uses in PAs could also leverage local support for protection against large-scale development interests such as logging, mining and oil extraction (Ferraro et al., 2013; Naughton-Treves et al., 2005; Nolte et al., 2013).

Most protected area evaluations use the six management categories developed by the International Union for Conservation of Nature to distinguish between strict versus multiple use PAs (IUCN; e.g. Ferraro et al., 2013; Joppa and Pfaff, 2011; Nolte et al., 2013). Strict protection falls under the IUCN categories I–IV, which prioritize biodiversity conservation over use. IUCN categories V and VI are less strictly protected multiple use areas and cultural landscapes shaped by human disturbance over time (Dudley, 2008). A number of researchers have questioned the use of IUCN categories as a measure of strictness as they were not originally designed for that purpose (Dudley et al., 2010). The concerns have been underscored by recent publications which show no clear correspondence between the IUCN designations and their level of protection (e.g. Joppa et al., 2008; Leroux et al., 2010; Muñoz and Hausner, 2013). Ferraro et al. (2013) distinguish between *de jure* protected area rules – legal regulations, and *de facto* management—management in practice, for evaluating strictness levels in PAs. Indeed PAs could be strictly protected through legislation, but poorly enforced, or *vice versa*, weakly regulated but strictly managed (Chhatre and Agrawal, 2008). Ostrom et al. (1994) also distinguishes between legal rules, rules-in-use and practice to explain management outcomes. The conservation rules in protected area networks are a product of decision-making and negotiation at different levels of organization. To truly include strictness level in impact evaluations we need to examine how protected areas are assigned to the IUCN categories, and how rules have been adjusted to the specific condition in the individual PAs (Hirschnitz-Garbers and Stoll-Kleemann, 2011).

In this paper we first elaborate why we need to consider site-specific conservation rules in conservation impact evaluations. Secondly, we illustrate how policy indicators based on conservation rules could be evaluated in two protected area networks—one in Norway and one in British Columbia, by use of content analysis, optimal scaling and data visualization tools. We analyze the consistency of conservation rules for the different IUCN categories across countries/regions and PA age and size. Finally, we discuss how policy indicators of site-specific conservation rules could be used in conservation impact evaluations.

1.1. Conservation rules in protected areas

Human activities in protected areas are regulated by rules which are “generally agreed-upon and enforced prescriptions that require, forbid, or permit specific actions” (Ostrom, 1986). Conservation rules for each individual PA are not necessarily the same as formal legal rules that are usually decided upon at a higher level of decision making (Ostrom et al., 1994). Conservation rules depend on how decision makers understand, translate and enforce rules in each individual PA. They are influenced by norms and practices specific to stakeholders and the managers of the PAs. Recent studies have shown how international conservation policies influence domestic legislation and management models differently depending on

national norms and practices (Fauchald et al., 2014; Hongslo et al., 2015). Pressey et al. (2015) refer to the “the tyranny of small decisions” to describe how decisions on different levels result in poor alignment between policies, management and conservation impacts. For example, conservation planning has suffered from the establishment of protected areas in remote locations where there are no real threats to biological diversity (Joppa and Pfaff, 2009; Tsianou et al., 2013). At the site level, Coad et al. (2015) argue that global protected area evaluations need to go beyond the area-based target set in Aichi Target 11 to also include measures of effective planning and management of protected areas. The quality of protected area management rather than formal designations decides how well protected areas perform. Furthermore, the increased multi-linkage nature of conservation, where power is dispersed over several levels of management with stakeholders participating at the various steps of rule-making (see Berkes, 2004; Dearden et al., 2005), is likely to create a mosaic of PAs with different conservation rules which must be evaluated empirically.

Conservation rules are usually reflected in the management plan which operationalizes and adjusts laws and policies made at higher levels to the specific sites (Eagles et al., 2014). A management plan is defined as a “document that sets out the management approach and goals, together with the framework for decision making, that should be applied in the protected area over a given period of time” (Thomas and Middleton, 2003). The management plan should support daily decision making by compiling all policies that apply to the specific PAs, including clearly defined overarching goals and site-specific rules (Eagles et al., 2014). Ideally, the management plan should describe any laws, norms and agreements that define the conservation rules in the park. Clearly stated management objectives, and the type and extent of the human activities allowed, are considered crucial for effective management.

Eagles et al. (2014) showed that the plan quality for visitor management for different categories of PAs differed substantially in Ontario Provincial Parks, with some PAs having less detailed plans for management than others, and some plans not even mentioning the uses and the level of use allowed in the park. They also found weak policy coherence between site-level and provincial level policies. Similarly, Muñoz and Hausner (2013) found alpine PAs in Spain to have vague goals for prioritizing biological diversity. Conservation rules were dependent on the specific autonomous regions and showed limited correspondence with national policies or IUCN categories. In this study, less than 50% of the PAs had a management plan. Similar results have also been found for other protected areas in Spain (Rodríguez-Rodríguez and Martínez-Vega, 2013), Greece (Vokou et al., 2014) and other European countries (Stoll-Kleemann, 2010). Given the lack of coherence with both national and international policies, and the strong regional influence of site-specific management of PAs, it is crucial to evaluate conservation rules before evaluating how protected areas perform.

There seems to be a discrepancy between formulations of objectives and conservation rules. For example, wilderness objectives are stated as a primary aim in many European PAs but conservation rules continue to support traditional resource uses such as grazing, mowing, hunting and fishing (Hausner, 2005; Linnell et al., 2015). Tsiafouli et al. (2013) demonstrated that human activities are highly present in the Natura 2000 protected area network in Europe (N=14 727). As much as 86.5% of the Natura 2000 sites permit agriculture and forestry, 52.7% allow fishing, hunting and gathering, 48.8% of the sites have transportation and communication infrastructure, while 17.6% permit mining and extraction activities. They also found a large variation in permitted human activities depending on norms and practices of the different Member States in the EU. Their study benefited from a publicly available dataset on human activities recorded by experts on each Natura 2000 site. Such databases are generally not available for protected area net-

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