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Stakeholder analysis for marine conservation planning using public participation GIS

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ABSTRACT

Stakeholders are presumed to represent different interests for marine and coastal areas with the potential to influence marine protected area planning and management. We implemented a public participation GIS (PPGIS) system in the remote Kimberley region of Australia to identify the spatial values and preferences for marine and coastal areas. We assessed similarities and differences in PPGIS participants (N = 578) using three operational definitions for "stakeholder" based on: (1) self-identified group, (2) self-identified future interests in the region, and (3) participant value orientation that reflects a preferred trade-off between environmental and economic outcomes. We found moderate levels of association between alternative stakeholder classifications that were logically related to general and place-specific participatory mapping behavior in the study region. We then analyzed how stakeholder classifications influence specific management preferences for proposed marine protected areas (MPAs) in the study region. Conservation-related values and preferences dominated the mapped results in all proposed marine reserves, the likely result of volunteer sampling bias by conservation stakeholder interests participating in the study. However, we suggest these results may also reflect the highly politicized process of marine conservation planning in the Kimberley where conservation efforts have recently emerged and galvanized to oppose a major offshore gas development and associated land-based infrastructure. Consistent with other participatory mapping studies, our results indicate that the chosen operational definition for stakeholder group such as group *identity* versus *interests* can influence participatory mapping outcomes, with implications for MPA designation and management. Future research is needed to better understand the strengths and limitations of participatory mapping that is framed in stakeholder perspectives, especially when sampling relies heavily on volunteer recruitment and participation methods that appear predisposed to participatory bias. In parallel, practical efforts to ensure that social research efforts such as this are included in MPA planning must remain of the highest priority for scientists and managers alike.

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1. Introduction

Marine protected areas (MPAs) are designated to enhance conservation of marine resources and provide an important tool to counter the rapid degradation of the world's oceans (Lubchenco, Palumbi, Gaines, & Andelman, 2003). Despite significant growth in recent years, the establishment of MPAs, as a percent of total marine area, lags terrestrial protected areas. In 2014, MPAs covered 3.4% of the global ocean area, 8.4% of the area under national jurisdiction (0–200 nautical miles), and 10.9% of all coastal waters, but only 0.25% of marine areas beyond national jurisdiction (Juffe-Bignoli et al., 2014). In contrast, 15.4% of the world's terrestrial areas, including inland waters, have protected area status (Juffe-Bignoli et al., 2014).

Stakeholders play a critical role in the establishment and management of MPAs which are often political and contentious as illustrated by events in Australia. In 2012, a Labor government announced an additional 2.3 million square kilometers would be added to the current Commonwealth marine reserve system, bringing the system total to over 3.1 million square kilometers. Marine reserve plans were approved for implementation in 2014,

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but with an electoral change to a Liberal government, the plans were suspended and the government commissioned a review of the system. The government stated the review fulfilled an election commitment to ensure that "management arrangements for the reserves reflect genuine and thorough consultation with stakeholders and are informed by the best available science" (Department of Environment, 2015).[1] Commercial fishing stakeholders were presumed to have played an important role in the government decision to suspend the reserve plans pending review.

There are multiple definitions for stakeholders, but one that fits the purpose of this study defines stakeholders as "any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system … who can be at any level or position in society, from global, national and regional concerns down to the level of household or intra-household, and be groups of any size or aggregation" (Grimble & Wellard, 1997, p. 176). Stakeholders can also include the nebulous categories of 'future generations', the 'national interest' and 'wider society' (Grimble & Wellard, 1997), with these categories often evoked as justification for the establishment of MPAs. A key distinction between stakeholders is those who affect decisions and those who are affected by decisions. This distinction has significant implications for stakeholder analysis methods that can identify stakeholder groups prior to the initiation of a planning process, or alternatively provide for the emergence of stakeholder groups through an inductive analysis of expressed preferences (Brown, de Bie, & Weber, 2015).

There is widespread agreement on the importance of incorporating stakeholders in meaningful participation for effective marine conservation planning and management (Charles & Wilson, 2009; Lundquist & Granek, 2005; Pomeroy & Douvere, 2008; Pollnac, Crawford, & Gorospe, 2001, 2010; Voyer, Gladstone, & Goodall, 2012), in all phases of marine conservation ranging from marine protected area design to implementation and management. Stakeholders can assist in the identification of marine spatial plan priorities and objectives, the selection of options, plan implementation and enforcement, and evaluation of outcomes (Pomeroy & Douvere, 2008). MPAs are unlikely to meet their biological or social goals unless the human dimensions or people-oriented factors are integrated into the MPA design and evaluation process (Charles & Wilson, 2009; Christie et al., 2003; Gruby, Gray, Campbell, & Acton, 2015; Pollnac et al., 2010). Indeed, some argue that MPA failure may be attributable to consultative failures in the early stages when an MPA is conceived, communicated, and discussed among stakeholders (Chuenpagdee et al., 2013). MPA designs that include both biodiversity conservation goals and multiple socioeconomic stakeholder interests are more likely to protect marine ecosystems (Christie, 2004; Klein et al., 2008), while MPA management strategies that find the "middle-ground" between government-led and community-based approaches may be most effective (Jones, 2002).

The purpose of stakeholder analysis is to inform the development and consideration of alternatives in the early stages of a project or proposal, or if a project or plan has been implemented, to effectively manage stakeholders and conflicts over the duration of the plan. Stakeholder analysis is particularly relevant for environmental issues such as marine conservation because potential impacts tend to cross-cut biophysical and social systems, involve multiple uses and user groups, contain externalities and trade-offs, and affect future availability or productivity of resources (Grimble & Chan, 1995; Grimble & Wellard, 1997). In the application of stakeholder analysis to marine conservation, stakeholder analysis appears especially important in the early stages of design and zoning of MPAs, but stakeholders can also be used to verify evidence collected in support of a marine spatial planning process (Shucksmith, Gray, Kelly, & Tweddle, 2014).

The need to identify and understand stakeholders is part of broader and increasing urgent calls to include social science in MPA planning and management. Gruby et al. (2015) advocate for research scoping the diverse values of MPAs, while Voyer et al. (2012) focus on social assessment, encouraging researchers to move beyond public participation. This paper makes an important contribution in progressing social research, with a strong spatial focus, while also extending our understanding of social assessments. This contribution involves understanding stakeholders and how their operational identity affects analysis of planning and management alternatives. Voyer et al. (2012) note the need to move beyond a generic perspective on public participation; this paper progresses our understanding by interrogating who is the "public" and provides methods for doing so.

1.1. Stakeholder analysis methods and participatory mapping

There are a range of methods for identifying and analyzing stakeholder perspectives for environmental planning and management, including marine conservation. For example, Reed et al. (2009) describe three steps in stakeholder analysis: identifying stakeholders, differentiating between and categorizing stakeholders, and investigating relationships between stakeholders. Grimble and Chan (1995) describe the following steps: identify the purpose of analysis (goals); develop an understanding of the system, decision makers, and drivers of decisions; identify principal stakeholders; investigate stakeholder interests, characteristics and circumstances; and identify patterns and contexts of interaction between stakeholders. Stakeholder analysis, as traditionally practiced, identifies key individuals and groups through expert-driven processes that do not usually include broad-based social surveys. For example, the Marine Life Protection Act initiative in California that established a system of marine reserves used a regional stakeholder group process where stakeholders were identified, appointed, and worked in small, staff-supported groups to develop multiple MPA proposals over the course of about one year (Fox et al., 2013).

The emergence of participatory mapping methods using geographic information is a relatively recent addition to the stakeholder analysis toolbox. Public participation geographic information systems (PPGIS), participatory GIS (PGIS), and volunteered geographic information (VGI) describe methods that commonly engage lay people (non-experts) to generate spatial information for a wide range of urban, regional, and environmental planning applications (see Brown & Kyttä, 2014; Brown, 2012, 2005). Participatory mapping for environmental applications often identifies place-based values (Brown & Reed, 2000) and place-based preferences (Brown, 2006). Mapped place-based values and preferences, when combined with participant characteristics, provide an alternative approach to common stakeholder identification methods. Most PPGIS/PGIS/VGI processes that inform environmental planning involve stakeholders given the broad definition of stakeholder that includes those affected by planning decisions. Schlossberg and Shuford (2005) describe how the term "public" in PPGIS can refer to decision makers, implementers, affected individuals, interested observers, or the general public—in other words, stakeholders.

With participatory mapping, the focus of stakeholder analysis expands from individuals and groups perceived to have more direct influence/power over marine planning decisions to those that are potentially affected by decisions. These individuals can be termed "latent" stakeholders (Mitchell, Agle, & Wood, 1997) that possess

[1] https://www.environment.gov.au/marinereservesreview/about.

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