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# Factors influencing the use of decision support tools in the development and design of conservation policy

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ABSTRACT

There are many examples of decision support tools used to analyse information with the intention of assisting conservation managers and policy makers in their decision making. We used structured interviews to collect information on seven case studies from Australia and New Zealand to identify the factors that led to the use (or non-use) of decision support tools when developing conservation policies. The interviews explored hypotheses derived from existing literature on the use of decision support tools in conservation policy. Qualitative analysis of the interviews indicated that key factors influencing the uptake of a decision support tool in conservation policy include the alignment of the tool with the objectives and context of a policy, and its ability to be useful even in the presence of missing data. Two other factors that had been suggested in past literature were not perceived by interviewees to be as important as the above two: the presence of a champion for the decision support tool within the management agency, and the time required to apply the tool. The interviews also revealed a number of additional factors that influenced use or non-use of decision support tools that we had not extracted from existing literature: ambiguity about policy objectives, the autonomy of the agency, and the employee time costs of applying the decision support tool.



## 1. Introduction

A decision support tool (DST) is a platform for integrating, analysing and displaying information to assist decision makers. In support of decisions for conservation management, a DST may provide insights into the consequences of different management strategies or approaches, identify the strategy that will optimise a specified objective, identify knowledge gaps, and provide transparency in decision making. Decision support tools can range from relatively simple to highly complex.

Many DSTs have been developed by researchers with the intention of assisting conservation managers and policy makers. For example, the Ecosystem Management Decision Support system has been widely applied to landscape analysis in the US (Reynolds et al., 2014). The Analytic Hierarchy Process uses pairwise comparisons to prioritise decisions, and has been applied to wide variety of environmental and other decision contexts worldwide (Omkarprasad and Kumar, 2006). Marxan (Ball et al., 2009) is a DST designed to identify a set of conservation areas that achieve a particular objective at minimum cost, and can explore trade-offs between conservation and socio-economic objectives. It is the most widely used and known DST for conservation planning, with 6078 users across 182 countries (see www.uq.edu.au/marxan). Another example, the Investment Framework for Environmental Resources (INFFER – Pannell et al., 2012), is a tool for developing environmental projects and prioritising them based on the criterion of value for money. The Framework has been trialled or used by well over half of Australia's 56 natural resource management regions, as well as other conservation organisations in Australia (Roberts et al., 2012), New Zealand (Jones and

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McNamara, 2014), Italy (Pacini et al., 2013) and Canada (see www.inffer.com.au).

Despite the benefits of DSTs, it is often observed that they are underutilised, or not utilised at all, by the intended end users (Nilsson et al., 2008; McIntosh et al., 2011). Several reasons are cited in the literature, including: different timeframes between policy decision making and scientific research (Briggs 2006; Cvitanovic et al., 2015); research results not providing the specific information needed to support management or policy (Pannell and Roberts 2009; Addison et al., 2013); lack of trust in the researchers by policy makers (Gibbons et al., 2008; McIntosh et al., 2011); low capacity of policy makers to use the research outputs in decision making (Rogers et al., 2015); and the lack of a champion within the policy organisation to enable and encourage uptake of the research results (Mumford and Harvey, 2014).

There has been little past research evaluating reasons why DSTs are or are not used in conservation management. A rare example is Addison et al. (2013), who investigated common objections to the use of models in conservation decision-making, based on collating statements made by researchers in the published and grey scientific literature. A common objection reported in the studies reviewed was the policy maker's preference for unstructured subjective judgements from experts, rather than predictive models. The key reason cited for this objection was the resource intensity (money and time) required to deliver useful results using these models.

McIntosh et al. (2011) identified the challenges for DST use in environmental management from the perspective of a group of international experts in environmental DST development. Their recommendations include: to find a champion within the policy-making organisation to promote the DST and to build capacity with the end users and stakeholders.

Past studies on DST adoption in conservation management have provided recommendations based on the researchers' experience. This study investigated the policy maker's perspective on the factors that led to the use (or non-use) of DSTs in the development of key conservation and environmental policies. Bridging the gap between the policy maker's and the researcher's perspectives could offer useful insights that will improve the uptake of DSTs in conservation decision making, and subsequently lead to more effective policy design.

We examined notable case studies in Australia and New Zealand, exploring the factors that facilitated or inhibited DST usage in policy and management, based on interviews with managers and policy makers. The selection of case studies was not intended to be representative of all possible conservation policies; however, they offer a diverse selection and have useful insights that may be transferable to other case studies and policies. The next section presents the criteria used for assessment of DSTs, a description of the case studies and an outline of the interview process. Section 3 provides results and Section 4 is a discussion of key findings and conclusions.

## 2. Methods

### 2.1. Factors that facilitate usage of decision support tools

To investigate the factors that influence the uptake and usage of decision tools, we gathered a team of Australian experts in decision support tool design and implementation. Through a literature review and facilitated discussion amongst the team, we identified a range of factors that are likely to promote or prevent the uptake of DSTs in environmental management and conservation decision making. These factors have elements in common with those identified in past studies of the uptake of scientific evidence and models in management and policy for conservation and environmental management (e.g., Rogers et al., 2015; Addison et al., 2013; Cook et al., 2012; McIntosh et al., 2011). The factors were:

- Presence of a champion for the tool within the agency
- Presence of an advocate for the tool outside of the agency
- Existence of a relationship between agency staff and tool experts
- Presence of large numbers of stakeholder groups affected by the policy outcome
- Ability of the tool to deal with missing information
- Whether the tool can be applied quickly
- Whether the policy process allows adequate time for tool use
- Whether the tool capabilities align with policy objectives

These factors were used to develop the questions used in the policy-maker interviews.

### 2.2. Case studies

We identified conservation and environmental policies as case studies to explore the degree to which the suggested factors influenced uptake and usage of the DSTs. Policies were selected using the following criteria: a decision tool existed that was deemed suited to the policy context; there was published evidence describing the process of policy development; and, relevant policy advisors for each policy were accessible for interview. Both marine and terrestrial policies were identified (Table 1). The policies were applicable at a national scale, with the exception of Threatened Species Protection in the Australian state of New South Wales, which was included for comparison with its national-scale counterparts. The staff size of the agencies responsible for each policy ranged from approximately 200, for the Great Barrier Reef Marine Park and Australian Fisheries Management authorities, to approximately 2000 for the Australian Commonwealth's Department of Environment. For each of the policies, written documentation and interviews with policy advisors were used to investigate the extent to which the matched decision tool was used, and the factors influencing this outcome.

### 2.3. Data collection

Data collection began by consulting the published literature related to each policy. The sources consulted included peer-reviewed literature, research reports, and government reports and websites. The literature was used to identify the steps taken in developing each policy and any decision tools that were used in policy development.

Policy advisors who had been involved in the development or administration of each policy were then interviewed. The objective of the interviews was to identify the reasons for the use or non-use of the matched DST in development of the policy and to examine the alignment of these reasons with the eight factors identified by the expert working group.

Interviewees were identified in the case study selection process via publications and reports related to the policy and by contacting the agencies responsible for each policy. The most senior policy advisors who had contributed to development or administration of the relevant policy were invited to participate. In total, ten policy advisors were interviewed, between one and three for each policy. The interviews were conducted by telephone and in-person in September and October 2013. Approximately 45 min was allocated for each interview. All interviews were conducted by the same project member.

Semi-structured interview scripts were used to direct the flow of the discussions. The script included questions on: the participant's educational background and current role within