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What drives the use of scientific evidence in decision making? The case of the South African Working for Water program

Phumza Ntshotsho [a,*], Heidi E. Prozesky [b], Karen J. Esler [c], Belinda Reyers [a]

[a] Natural Resources and the Environment, CSIR, P.O. Box 320, Stellenbosch 7599, South Africa
[b] Department of Sociology & Social Anthropology and Centre for Invasion Biology, Stellenbosch University, Private Bag x1, Matieland 7602, South Africa
[c] Department of Conservation Ecology & Entomology and Centre for Invasion Biology, Stellenbosch University, Private Bag x1, Matieland 7602, South Africa

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ABSTRACT

Academic scientific literature abounds with critique of natural resource managers for not utilising scientific evidence when making decisions in their day-to-day operations. Little regard is given by the critics to the practical constraints on the use of research findings, as experienced by managers in their work environments. To explore these issues, we conducted a case study of the Working for Water (WfW) program, a government-funded invasive alien plant (IAP) management program that has been operational in South Africa for nearly two decades. We investigated the extent to which decision makers in WfW use scientific evidence to inform their decisions pertaining to the clearing of IAPs and also identified opportunities for, and constraints to, evidence-based practice. Our results indicate that the use of scientific evidence is limited by the fact that the management of natural resources involves much more than science. The social context within which decisions are made, which includes organizational structure, priorities and capacity, plays an important part in the extent to which science informs practice. On the basis of our findings, we highlight the importance of generating evidence in practice through an iterative process of implementation, monitoring, learning and reflection, and subsequent feedback into the planning of restoration projects.

1. Introduction

Despite widespread acknowledgement that conservation actions are best guided by evidence of the effectiveness of past interventions (Sutherland et al., 2004; Ferraro and Pattanayak, 2006; Pullin and Stewart, 2006; Roberts et al., 2006; Pullin and Knight, 2009), conservation decisions continue to be based on anecdote and practical experience (Pullin et al., 2004; Mathevet and Mauchamp, 2005; Cabin et al., 2010; Cook et al., 2010). This has been attributed to several factors, including lack of, or limited access to, scientific evidence (Roberts et al., 2006; Gibbons et al., 2008). Mathevet and Mauchamp (2005) propose that scientific evidence has a minor role to play in the human processes involved in conservation action. Indeed, if we concur that conservation action takes place in a socioecological context, it is inevitable that social issues play a paramount role in how decisions are made. In simple terms, conservation is less about science and more about people and the choices they make (Balmford and Cowling, 2006).

The socio-economic and political context, as well as the organizational or institutional confines within which decision makers operate, would arguably influence the extent to which decisions are based on science (if at all). For example, it has been noted that deficiencies in institutional effectiveness and organizational capacity are major constraints on the implementation of conservation action (Cowling et al., 2008; Sitas et al., 2013). Indeed, organizational systems and processes have been identified as one of 12 thematic areas of importance to the conservation of global biodiversity (Sutherland et al., 2009). Thus, a fuller understanding of the management of natural resources requires that we pay attention to such social aspects. In their critique of the term "evidence-based conservation", Adams and Sandbrook (2013) call for a move away from the ingrained bias towards quantitative data on the grounds that it is believed to be more rigorous, testable and hence reliable. Instead, they encourage a more informed understanding of how policy-making works, one that recognises that "scientific evidence" is one source of information among many, including local knowledge and qualitative data, for decision-makers.

Understanding the social aspects of decision and policy-making processes requires a new type of conservation science – one that

* Corresponding author. Tel.: +27 (0) 21 888 2623.
E-mail addresses: pntshotsho@csir.co.za (P. Ntshotsho), hep@sun.ac.za (H.E. Prozesky), kje@sun.ac.za (K.J. Esler), breyers@csir.co.za (B. Reyers).

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moves away from a reliance on literature reviews and surveys of scientists (e.g. Knight et al., 2008) towards an engagement with key actors in the decision-making context, i.e. the implementers and managers (Wilhelm-Rechmann and Cowling, 2011). This should be paired with rigorous and replicable methods to explore and measure the use of science in decisions and policy. To this end, we developed and conducted an assessment of a large and well-established invasive alien plant (IAP) management program that has been operational in South Africa for nearly two decades (van Wilgen et al., 2012). The Working for Water (WfW) program was specifically chosen as a case study because of its relatively long history, which we anticipated would provide an understanding of how decision-making processes within the program have changed over time, and the role, if any, of science in that change.

WfW was established in 1995 with the primary aim of clearing IAPs in order to increase water supply, while providing employment to marginalized sectors of South African society. From an initial budget of R25 million (approx. 2.17 million USD at the current exchange rate) in 1995, the program grew to a budget of R1.28 billion (approx. 111 million USD) in the 2013/14 financial year (WfW historical expenditure, http://sites.google.com/site/wfwplanning). The size of the budget alone raises the question, "is the money being spent effectively"? Notably, it has been stated that current rates of, and approaches to, clearing are not sufficient to bring the problem of IAPs in South Africa under control (Marais et al., 2004; van Wilgen et al., 2012). This, then, led us to question whether management decisions are based on the best available evidence of effectiveness of clearing approaches.

The overall aim of the study was to explore the use of scientific evidence in decision making in the WfW program using a case study approach. First, we identified historical events that could have influenced the integration of scientific information into the WfW program. We also investigated the manner in which scientific information becomes absorbed into the program by considering the sources of information and partners involved in the exchange of information. Moreover, we sought to determine the extent to which scientific information has been used in the past, and continues to be used, as a basis for decision making, by asking the practitioners and analysing the sources of information used.

2. Material and methods

2.1. Approach

We used the case study design approach, a research design traditionally associated with the social sciences. Yin (2009) defines a case study as an empirical inquiry that investigates a phenomenon in depth and within its real-life context. As such, the main distinguishing feature of case study research is that it seeks to contextualise, rather than generalise (Babbie and Mouton, 2001). Because of this focus on context, the case study approach is especially recommended when research questions seek to explain "how" or "why" some social phenomenon operates (Yin, 2009). In this instance we sought to investigate the use of scientific evidence in the management of IAPs by establishing which events or circumstances may have influenced the use of scientific evidence in the WfW program (i.e. "why" is science used [or not] in the program), and "how" scientific evidence is used. Another distinguishing attribute of case study research is that it uses multiple sources of evidence and it is critical that there is sufficient access to potential data sources (Yin, 2009). The rationale for using multiple sources of evidence is based on the ideas of replication and convergence, which in turn, increase the reliability of findings (Babbie and Mouton, 2001). To fulfil this requirement, we analysed both interview data and existing documents in our study.

2.2. Management structure review

In any case study of a large program such as WfW, identifying potential respondents is a critical and often challenging task. While WfW is a national program, decisions are made at various levels, including regional or provincial and project levels. As a starting point, we contacted regional offices to obtain contact details of program leaders, implementation managers, area managers and project managers. Regional program leaders (RPLs) are the most senior managers at the regional level, with several area managers and project managers reporting to them. RPLs were identified as key actors in decision-making processes, and were thus chosen as initial respondents.

2.3. Manager interviews

Having obtained the necessary ethical clearance from the relevant authority, we conducted pilot interviews with six respondents from the national and regional offices in order to refine the final interview schedule (Appendix A: Supplementary material), whereafter collection of interview data could commence. At the time of the study there were seven RPLs, five of whom were willing to participate in the study. We conducted semi-structured interviews by telephone, in English, with these five RPLs (who were all sufficiently competent in English). This initial sampling approach was supplemented with snowball sampling, by requesting the RPLs to recommend other potential respondents who could provide valuable input, from among their respective area, project managers and data managers. After 21 interviews, data saturation had been reached (i.e. no new information was forthcoming), and it was decided to cease interviewing. The interviews were transcribed and converted to Microsoft Word documents for analysis.

2.4. Document acquisition

Policy documents such as program guidelines, strategy documents and operating documents that were referred to by respondents were obtained from the following organizational websites: http://www.environment.gov.za/workingforwater/resources/index.htm and http://sites.google.com/site/wfwplanning. Any other documents which were mentioned by respondents as having had an influence on the program's operations, without necessarily being adopted as policy documents (e.g. an article on the extent of invasion, emanating from the Southern African Plant Invader Atlas [SAPIA] project; and prioritization reports recently produced by the Council for Scientific and Industrial Research [CSIR]) were also obtained, either from the program's websites or via internet searches.

2.5. Data analysis

Both the interview transcripts and documents were analysed using computer-assisted qualitative data analysis software (CAQDAS), namely ATLAS.ti (Version 7.0, Scientific Software Development, Berlin), which allows the retrieval of relevant segments of text from large amounts of unstructured textual data through a process called coding (Smit, 2005). Coding is a major step in qualitative data analysis and involves careful reading of textual data, searching for relevant segments and labelling those segments with descriptive or summative words or category names (codes) that express some essential quality (Charmaz, 2006; Saldana, 2009). Below, the coding process we followed is elucidated.

Two constructs were chosen for analysis, i.e. "key historical events" (that could have influenced the extent to which science is used in the WfW program) and "decision making" (any other