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Review

Stakeholder participation for environmental management: A literature review

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ABSTRACT

The complex and dynamic nature of environmental problems requires flexible and transparent decision-making that embraces a diversity of knowledges and values. For this reason, stakeholder participation in environmental decision-making has been increasingly sought and embedded into national and international policy. Although many benefits have been claimed for participation, disillusionment has grown amongst practitioners and stakeholders who have felt let down when these claims are not realised. This review first traces the development of participatory approaches in different disciplinary and geographical contexts, and reviews typologies that can be used to categorise and select participatory methods. It then reviews evidence for normative and pragmatic benefits of participation, and evaluates limitations and drawbacks. Although few of the claims that are made have been tested, there is evidence that stakeholder participation can enhance the quality of environmental decisions by considering more comprehensive information inputs. However, the quality of decisions made through stakeholder participation is strongly dependant on the nature of the process leading to them. Eight features of best practice participation are then identified from a Grounded Theory Analysis of the literature. These features emphasise the need to replace a "tool-kit" approach, which emphasises selecting the relevant tools for the job, with an approach that emphasises participation as a process. It is argued that stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning. Where relevant, participation should be considered as early as possible and throughout the process, representing relevant stakeholders systematically. The process needs to have clear objectives from the outset, and should not overlook the need for highly skilled facilitation. Local and scientific knowledges can be integrated to provide a more comprehensive understanding of complex and dynamic socio-ecological systems and processes. Such knowledge can also be used to evaluate the appropriateness of potential technical and local solutions to environmental problems. Finally, it is argued that to overcome many of its limitations, stakeholder participation must be institutionalised, creating organisational cultures that can facilitate processes where goals are negotiated and outcomes are necessarily uncertain. In this light, participatory processes may seem very risky, but there is growing evidence that if well designed, these perceived risks may be well worth taking. The review concludes by identifying future research needs.

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Contents

1. Introduction

Environmental problems are typically complex, uncertain, multi-scale and affect multiple actors and agencies. This demands transparent decision-making that is flexible to changing circumstances, and embraces a diversity of knowledges and values. To achieve this, stakeholder participation is increasingly being sought and embedded into environmental decision-making processes, from local to international scales (e.g. Stringer et al., 2007). Widespread acceptance and promotion of participation has partly been driven by increasing public scepticism about science, increasing knowledge and interest in environmental decisions (Irwin's (1995) "citizens' science") and ongoing policy trends that emphasise sustainable development and partnership working (Younge and Fowkes, 2003; Richards et al., 2004). Participation in environmental decision-making is increasingly becoming regarded as a democratic right (and is enshrined as such in the United Nations Economic Commission for Europe's 1998 Arhus Convention), and this right is increasingly being used by proliferating environmental interest and pressure groups. In addition to normative arguments such as this, many pragmatic benefits have been claimed for participation; by involving stakeholders, it is argued that the quality and durability of decisions is likely to be greater (e.g. Fischer, 2000; Beierle, 2002; Reed et al., in press). However, such claims have rarely been tested, and there is growing disillusionment among environmental managers and conservationists who have failed to see these claims realised. Others have sought to address and move beyond these critiques, learning from the mistakes of the participation panacea, to develop a more sensitive, post-participation approach.

This literature review aims to examine evidence for the claims that have been made for and against stakeholder participation and, on this basis, to identify suggestions for best practice participation. This is done in the context of a brief history of participatory approaches to environmental decision-making, and the typologies that have been developed to understand the basis for stakeholder participation. In this article, participation is defined as a process where individuals, groups and organisations choose to take an active role in making decisions that affect them (Wandersman, 1981; Wilcox, 2003; Rowe et al., 2004). This definition focuses on stakeholder participation rather than broader public participation, if stakeholders are defined as those who are affected by or can affect a decision (after Freeman, 1984). This article focuses on stakeholder participation because for purposes of efficiency, most conservationists focus on engaging those who hold a stake (whether directly or indirectly) in the scope of their initiative, rather than attempting to meaningfully engage with the wider public.

1.1. *Histories and typologies of participation*

Approaches to stakeholder participation have progressed through a series of recognisable phases: from awareness raising in the late 1960s (the anti-modernisation critique of the transfer of technology paradigm; see van Tatenhove and Leroy (2003) for a review); incorporating local perspectives in data collection and planning in the 1970s (Pretty, 1995a,b); the development of techniques that recognised local knowledge and "put the last first" such as farming systems research and rapid and participatory rural appraisal in the 1980s (Chambers, 1983); increasing use of participation as a norm in the sustainable development agenda of the 1990s (e.g. UNCED, 1992); the subsequent critique of participation and disillusionment over its limitations and failings (e.g. Cooke and Kothari, 2001); and finally to a growing "post-participation" consensus over best practice, learning from the mistakes and successes of this long history (e.g. Hickey and Mohan,

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Table 1 – Typologies of participation

Basis of typology	Example
Typology based on different degrees of participation on a continuum. Numerous alternative terms suggested for different rungs of the ladder (e.g. Biggs, 1989; Pretty, 1995a,b; Farrington, 1998; Goetz and Gaventa, 2001; Lawrence, 2006).	Arnstein's (1969) ladder of participation. Sometimes presented as a wheel of participation Davidson (1998).
Typology based on nature of participation according to the direction of communication flows	Rowe and Frewer (2000)
Typology based on theoretical basis, essentially distinguishing between normative and/or pragmatic participation.	Thomas (1993), Beierle (2002)
Typology based on the objectives for which participation is used.	Okali et al. (1994), Michener (1998), Warner (1997), Lynam et al. (2007), Tippett et al. (2007)

2005). These developments have taken place in parallel geographical and disciplinary contexts. For example, lessons have emerged from: social activism (Freire and Ramos, 1970); adult education (Kolb, 1984; McKernan, 1991); applied anthropology (e.g. IDS, 1979; Rhoades, 1982); complex systems (von Bertalanffy, 1968; Gunderson and Holling, 2000); natural resource management (e.g. Johnson et al., 2004); and ecology (e.g. Mapinduzi et al., 2003). While public consultation over environmental decision-making was growing in the industrialised world, a more action-orientated, site-specific approach was emerging in developing world contexts (Lawrence, 2006). Now the developed world is beginning to "learn from the south" and apply participatory methods and approaches emerging from developing world contexts (Dougill et al., 2006; Stringer et al., submitted for publication).

During the history of its development and in the different contexts where it has been applied, participation has become loaded with ideological, social, political and methodological meaning, giving rise to a wide range of interpretations (Lawrence, 2006). Rather than viewing these as competing with each other, typologies have been developed to understand the differences between these interpretations and their associated approaches and methods, and understand the different contexts in which they are most appropriate (Table 1). These typologies can be used *a priori* to choose participatory methods on the basis of the type of participation required, or can be used *post-hoc*, to categorise the type of participation that has occurred.

The first typologies distinguished between the degree to which stakeholders were engaged. Arnstein's (1969) "ladder of participation" described a continuum of increasing stakeholder involvement, from passive dissemination of information (which she called "manipulation"), to active engagement ("citizen control"). Numerous alternative terms have been suggested for the different rungs of this ladder (e.g. Pretty, 1995a,b; Goetz and Gaventa, 2001). One of the most widely used is Bigg's (1989), who described the level of engagement as a relationship that can be "contractual", "consultative", "collaborative" and "collegiate". Farrington (1998) simplified this to a distinction between participation that is "consultative", "functional" (i.e. enhancing project implementation through local labour and knowledge), or "empowering". Lawrence (2006) built on this, proposing "transformative" participation as an alternative top rung of the ladder, and emphasising the idea that empowerment should lead to the transformation of the communities who are involved. The hierarchical nature of the ladder metaphor implies that higher rungs should be preferred over lower rungs, and much of the literature makes this assumption explicitly (e.g. Arnstein, 1969; Johnson et al., 2004). However, different levels of engagement are likely to be appropriate in different contexts, depending on the objectives of the work and the capacity for stakeholders to influence outcomes (Richards et al., 2004; Tippett et al., 2007). For this reason, a "wheel of participation" has been suggested as an alternative metaphor that emphasises the legitimacy of different degrees of engagement (Davidson, 1998).

Rowe and Frewer (2000) focus on the nature rather than the degree of engagement, identifying different types of public engagement by the direction that communication flows between parties. According to this view, information dissemination to passive recipients constitutes "communication", gathering information from participants is "consultation" and "participation" is conceptualised as two-way communication between participants and exercise organisers where information is exchanged in some sort of dialogue or negotiation.

Other typologies focus on the theoretical basis, essentially distinguishing between participation that is normative and/or pragmatic. Normative participation focuses on process, suggesting that people have a democratic right to participate in environmental decision-making. Pragmatic arguments focus on participation as a means to an end, which can deliver higher quality decisions (see next section). The contrast between these two types of participation has been conceptualized in many different ways. For example Habermass' (1987) "communicative action" theory suggests participation should be "fair", representing the full range of relevant stakeholders and equalising power between participants, in addition to being "competent" (resulting in settled claims) (c.f. Renn et al., 1995; Webler, 1995; Webler and Tuler, 2000). This distinction has also been conceptualised as the need for "public acceptance" versus "decision quality", or "political" versus "technical" participation (Thomas, 1993; Beierle, 2002).

Alternatively, there have been a number attempts to develop typologies on the basis of the objectives for which participation is used. For example, Okali et al., 1994 distinguished between "research-driven" versus "development-driven" participation. Similarly, Michener (1998) contrasted "planner-centred" participation that is focused on outcomes with "people-centred" participation, which builds capacity and empowers stakeholders to define and meet their own needs. Warner (1997) argued that neither of these categories adequately reflected the sort of sustainability objectives that participatory processes are commonly used to meet. Instead, he proposed a third category focused on building consensus (which he defined as "a condition in which all participants

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can live with the result" p. 417), which he deemed necessary to achieve sustainability objectives (see van de Kerkhof (2006) for a critique of this approach). Focusing instead on the operational objectives of participation, Lynam et al. (2007) distinguished between "diagnostic and informing", "co-learning" or "co-management" methods, and Tippett et al. (2007) considered the differences between methods to: inform; design active engagement processes; consult; deliver implementation of management plans; or to monitor and learn from the effectiveness of participatory practice.

Each of these typologies offer an alternative basis for distinguishing between the numerous available methods and approaches for stakeholder participation, and provide a basis for selecting the methods that are likely to be most appropriate to the purpose of the work in a given context. Before considering how such methods can be embedded into an appropriate process, some of the potential benefits, drawbacks and limitations of stakeholder participation will be reviewed next.

1.2. *Benefits of participation: evidence for the claims?*

The many claimed benefits of stakeholder participation have to an extent driven its widespread incorporation into national and international policy. At the same time, disillusionment has been growing amongst practitioners, stakeholders and the wider public, who feel let down when these claims are not realised. These claims can be broadly categorised under normative and pragmatic arguments for stakeholder engagement in environmental decision-making.

Normative claims focus on benefits for democratic society, citizenship and equity. For example, it is argued that stakeholder participation reduces the likelihood that those on the periphery of the decision-making context or society are marginalised. In this way, more relevant stakeholders can be included in decisions that affect them and active citizenship can be promoted, with benefits for wider society (Martin and Sherington, 1997). Stakeholder participation may increase public trust in decisions and civil society, if participatory processes are perceived to be transparent and consider conflicting claims and views (Richards et al., 2004). Stakeholder participation, it is argued, can empower stakeholders through the co-generation of knowledge with researchers and increasing participants' capacity to use this knowledge (Greenwood et al., 1993; Okali et al., 1994; MacNaughten and Jacobs, 1997; Wallerstein, 1999). It is claimed that stakeholder participation may increase the likelihood that environmental decisions are perceived to be holistic and fair, accounting for a diversity of values and needs and recognising the complexity of human-environmental interactions (Richards et al., 2004). It may also promote social learning (Blackstock et al., 2007). This is where stakeholders and the wider society in which they live, learn from each other through the development of new relationships, building on existing relationships and transforming adversarial relationships as individuals learn about each others' trustworthiness and learn to appreciate the legitimacy of each other's views (Forester, 1999; Pahl-Wostl and Hare, 2004; Leeuwis and Pyburn, 2002; Stringer et al., 2006). Fritsch and Newig, in press argue that social learning may be one of a number of mechanisms that can deliver more pragmatic benefits from participation, with groups of people developing more creative solutions through reflective deliberation.

Pragmatic claims focus on the quality and durability of environmental decisions that are made through engagement with stakeholders. It is argued that participation enables interventions and technologies to be better adapted to local socio-cultural and environmental conditions. This may enhance their rate of adoption and diffusion among target groups, and their capacity to meet local needs and priorities (Martin and Sherington, 1997; Reed, 2007; Reed and Dougill, submitted for publication). Participation may make research more robust by providing higher quality information inputs (Hansen, 1994; Reed et al., 2006, in press). By taking local interests and concerns into account at an early stage, it may be possible to inform project design with a variety of ideas and perspectives, and in this way increase the likelihood that local needs and priorities are successfully met (Dougill et al., 2006). It is argued that participatory processes should lead to higher quality decisions, as they can be based on more complete information, anticipating and ameliorating unexpected negative outcomes before they occur (Fischer, 2000; Beierle, 2002; Koontz and Thomas, 2006; Newig, 2007; Fritsch and Newig, in press). By establishing common ground and trust between participants and learning to appreciate the legitimacy of each others' viewpoints, participatory processes have the capacity to transform adversarial relationships and find new ways for participants to work together (Stringer et al., 2006). This may lead to a sense of ownership over the process and outcomes. If this is shared by a broad coalition of stakeholders, long-term support and active implementation of decisions may be enhanced (Richards et al., 2004). Depending on the nature of the initiative, this may significantly reduce implementation costs.

However, there is growing concern that stakeholder participation is not living up to many of the claims that are being made. Stakeholder participation does not take place in a power vacuum: the empowerment of previously marginalised groups may have unexpected and potentially negative interactions with existing power structures (Kothari, 2001). There are ways in which participation can reinforce existing privileges and group dynamics may discourage minority perspectives from being expressed (Nelson and Wright, 1995), creating "dysfunctional consensus" (Cooke, 2001, p. 19). Consultation fatigue may develop as stakeholders are increasingly asked to take part in participatory processes that are not always well run, and as they perceive that their involvement gains them little reward or capacity to influence decisions that affect them (Burton et al., 2004; Cosgrove et al., 2000; Duane, 1999; Handley et al., 1998; Wondolleck and Yaffee, 2000). In this context, it has been claimed that participatory processes can become "talking shops" that create ambiguities and delay decisive action (Bojorquez-Tapia et al., 2004; Vedwan et al., 2008). This may be compounded by the existence of non-negotiable positions or actors with veto power, that limit the extent to which the process can empower participants to influence decisions. For example, Broad et al., 2007 describe Water Allocation Groups established for participatory water governance in Brazil whose decisions could be over-ruled by the Government's Water Council. The

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resulting cynicism can lead to declining levels of engagement and put the credibility of participation at risk. This credibility has also been questioned on the basis that many stakeholders may not have sufficient expertise to meaningfully engage in what are often highly technical debates (e.g. Fischer and Young, 2007).

Despite the rhetoric and the concerns that have been expressed, there have been few attempts to investigate the validity of the many claims that have been made for stakeholder participation (Webler, 1999; Beierle, 2002; Brody, 2003; Blackstock et al., 2007). The few attempts that have been made have tended to focus on evaluating the process rather than the outcomes (e.g. Beierle, 1999; Renn et al., 1995; Rowe and Frewer, 2000). This may be partly due to the challenge of selecting appropriate evaluation criteria and data collection methods. Blackstock et al., 2007 argue that the evaluation of participatory processes should itself be participatory, with stakeholders selecting and applying the evaluation criteria. However, this is not straightforward. Webler and Tuler, 2006) found strong differences of opinion between participants that they selected from ten case studies, about what constituted a "good" participatory process. Notwithstanding such differences, it may still be possible to develop evaluation criteria with stakeholders. For example, Chase et al., 2004 derived criteria from theory, which they prioritised with stakeholders in two case studies through questionnaires. Although there was a wide range of opinion, the criteria cited most frequently were: "using the best available scientific information, having a genuine influence on decisions, promoting communication and learning, and treating all citizens equally" (Chase et al., 2004, p. 635).

More commonly, participation is evaluated in the absence of stakeholder engagement, on the basis of criteria derived from theory and the analysis of cases (Chase et al., 2004). For example, Chess and Purcell (1999, p. 2685) evaluated the extent to which "process" and "outcome" goals were achieved through a range of participatory methods. They found that the extent to which these goals were met did not differ between the different methods (public meetings, workshops, or citizen advisory committees). Instead success was influenced by the way that group dynamics were handled by facilitators (e.g. dealing with dominant individuals and placing participants in reactive positions), communication with participants (e.g. lack of information or publicising events and condescending attitudes towards participants), the clarity of goals that were set, and the quality of planning. Brody, 2003 evaluated whether stakeholder participation had improved the quality of local plans for the long-term management of ecological systems on the basis of theoretically-derived criteria, and found that the presence of specific stakeholders significantly increased their quality. Koontz, 2005 conducted a multiple-case analysis to evaluate the extent to which stakeholder participation influenced the recommendations of community-based task-forces developing local farm preservation policy in the United States. He only found a significant effect in counties where the citizens and the elected officials were highly concerned about the issues involved, and where participants were connected with strong social networks that focussed on the issues being discussed. Similarly, Fritsch and Newig, in press conducted a meta-analysis of 35 cases of local or regional participatory environmental decision-making in North America and Western Europe to evaluate participatory processes, context and environmental outcomes. They concluded that the most important determinant of environmental effectiveness was the interests and goals of the participants, and how strongly they favoured sustainable environmental outcomes. Sultana and Abeyasekera, 2007 analysed 36 cases of community fisheries management in Bangladesh with and without stakeholder participation during planning, and found statistical evidence that participation led to greater uptake of conservation measures and fewer conflicts between stakeholders. Beierle (2002) coded information from 239 published case studies of stakeholder involvement in environmental decision-making and found evidence that stakeholders improved the quality of decisions that were made in the majority of cases, adding new information, ideas, and analysis. Based on this analysis, Beierle (2002) concluded that more intensive stakeholder processes are more likely to yield higher quality decisions. Although only a few studies have evaluated a handful of the claims that have been made for stakeholder participation, the available evidence appears to support the claims that have been evaluated.

Although these studies suggest that stakeholder participation may improve the quality of environmental decisions, they do so with one strong caveat: the quality of a decision is strongly dependant on the quality of the process that leads to it. Through a combination of quantitative evaluations like these, and insights from qualitative studies and case studies (which are far more abundant), best practice in stakeholder participation is now beginning to emerge, and is reviewed in the next section.

1.3. *Best practice stakeholder participation*

When individual practitioners and stakeholders are asked, much disagreement still exists over what constitutes best practice. For example, Webler et al. (2001, 2006) used Q methodology (a form of factor analysis used to study subjective viewpoints among participants) to identify four distinct views of best practice from those who had taken part in ten participatory processes, who differed over how to tackle issues of power and trust, and the role of strong leadership/direction and scientific information. However, such views are not mutually exclusive, and a review of the literature shows that a broad consensus over key features of best practice is emerging from "post-participation" disillusionment.

A theme running through this literature is the need replace the "tool-kit" approach to participation, which emphasises selecting the relevant tools for the job, with an approach that views participation as a process. Perhaps a more appropriate metaphor for this view of participation is a "service contract" (such as one might draw up for office cleaning or boiler maintenance). This view emphasises the people who use the tool-kit in the context of a long-term relationship where the parties develop mutual trust and respect as they learn from each other to negotiate potential solutions. To be successful, this process needs to be underpinned by an appropriate philosophy, and consider how to engage the relevant stakeholders at the most appropriate time and in a manner that will enable them to fairly and effectively shape

environmental decisions. The rest of this section reviews eight key features of best practice participation that have emerged from a Grounded Theory Analysis of the literature. Grounded Theory is a qualitative method used to systematically analyse large bodies of text, to construct theoretical models that are "grounded" in the text (Corbin and Strauss, 1990). It is performed by reading texts with specific questions in mind, coding passages using keywords as answers emerge, and using the keywords to sort quotes into themes from which theory can be derived.

2. Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning

The "service contract" view of participation as a process emphasises the need for flexibility, adapting to different and changing circumstances. Given the wide choice of tools and process designs that are available, and the need to respond rapidly to dynamic contexts, a strong philosophical underpinning is necessary to guide the development of the process as it unfolds.

The first component of this philosophy that is emphasised in the literature is the need to empower participants through participation. This takes two forms: (i) ensuring that participants have the power to really influence the decision (Fiorino, 1990; Laird, 1993; Chase et al., 2004; Tippett et al., 2007); and (ii) ensuring that participants have the technical capability to engage effectively with the decision (Richards et al., 2004). If a decision has already been made or cannot really be influenced by stakeholders, then participation is not appropriate. This situation is analogous to Rowe and Frewer (2000) one-way flow of information from decision-makers to stakeholders, the lower rungs of Arnstein's (1969) ladder, or Lynam et al.'s (2007) "diagnostic and informing" mode of participation (Section 2.2). It may be less obvious if stakeholders come to the table with non-negotiable positions, for example due to the statutory obligations of some organisations that prevent them from compromising with others on certain issues (Richards et al., 2004). Such limitations need to be identified and flagged up at the start of any participatory process, which may need to be bounded accordingly, to avoid frustration and potential conflict.

It is not enough simply to provide stakeholders with the opportunity to participate in decision-making though; they must actually be able to participate (Weber and Christopherson, 2002). When decisions are highly technical, this may involve educating participants, developing the knowledge and confidence that is necessary for them to meaningfully engage in the process. For example, in Citizen's Juries (Crosby, 2003), stakeholders listen to "expert witnesses" present different arguments before making their decision. Alternatively, permaculture training provides land managers with environmental management skills based on ecological principles; and provides support and feedback to those designing their own management systems, so that they can share their knowledge with neighbours in a self-propagating system.

Power inequalities within groups represent an equally important barrier to meaningful engagement. It is necessary to consider how inequalities in age, gender and background can be overcome to enable stakeholders to participate on a level playing field. For example, Prell et al. (2007), worked with a highly heterogeneous group consisting of stakeholders with educational backgrounds ranging from PhDs to no formal education. To cope with this, they replaced the use of post-it notes and flip-charts in workshops, with site visits where the participants (who were all used to working outside), could use the landscape as their visual aid. By working intensively with a small group, building in opportunities to socialize with each other, this process was also designed to enhance trust and enhance relationships between participants. By explicitly dealing with issues of power and trust in this way, it may be possible to give all stakeholders a voice in the resulting dialogue. This increases the likelihood that the participatory process is perceived to be both fair and valid by those inside and outside the decision-making process (Tippett et al., 2007). Implicit in this discussion is a sense of mutual respect between stakeholders and those facilitating the participatory process. In particular, the time that stakeholders voluntarily invest in the process needs to be highly valued.

Finally, the literature suggests that any philosophy of participation should emphasise iterative and two-way learning between participants (Chase et al., 2004; Johnson et al., 2004; Lynam et al., 2007). This includes learning between participants who may have very different knowledges and perspectives, and between stakeholders and researchers. The adaptive management literature emphasizes the need for iterative learning in long-term participatory processes, where participants experimentally monitor the outcomes of their decisions and adapt them accordingly (Gunderson and Holling, 2002). Although this may take many years, such iterative learning can be achieved over much shorter time-scales by using computational models to explore the likely socio-ecological consequences of decisions, which can be adapted through successive dialogue with stakeholders and model runs (Prell et al., 2007).

2.1. *Where relevant, stakeholder participation should be considered as early as possible and throughout the process*

When implementing a participatory process, stakeholder participation should be considered right from the outset, from concept development and planning, through implementation, to monitoring and evaluation of outcomes. Engagement with stakeholders as early as possible in decision-making has been frequently cited as essential if participatory processes are to lead to high quality and durable decisions (e.g. Mazmanian and Nienaber, 1979; Stewart et al., 1984; Blahna and Yonts-Shepard, 1989; Gariepy, 1991; Beltson, 1995; Chess and Purcell, 1999; Reed et al., 2006). Typically, stakeholders only get involved in decision-making at the implementation phase of the project cycle, and not in earlier project identification and preparation phases. Increasingly they may also be involved in monitoring and evaluating the outcomes of the decision-making process (Estrella and Gaventa, 2000). However, unless flexibility can be built into the project design, this can mean that stakeholders are invited to get involved in a project that is at variance with their own needs and priorities. This may make it a challenge to motivate stakeholders to en-

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gage with the decision-making process, and those who are engaged may be placed in a reactive position, where they are asked to respond to proposals that they perceive to have already have been finalised (Chess and Purcell, 1999). Prell et al. (2007) present one of the few documented examples of stakeholder engagement right from the development of the initial concept. This was made possible by seed-corn funding from the Rural Economy and Land Use programme where stakeholders developed a project proposal with researchers in a Scoping Study. A review of the programme's seed-corn funding showed that it played a crucial role in catalysing interdisciplinary collaborations to tackle complex problems, and recommended wider use of such funding mechanisms (Meagher and Lyall, 2007). Reed et al. (2006, in press) showed how stakeholders could be actively engaged in sampling design, data collection and analysis, in addition to more traditional roles.

2.2. *Relevant stakeholders need to be analysed and represented systematically*

Stakeholder analysis is increasingly being used to systematically represent those relevant to environmental decision-making processes (Grimble and Wellard, 1997; Reed et al., submitted for publication). Stakeholder analysis is a process that: (i) defines aspects of a social and natural system affected by a decision or action, (ii) identifies individuals and groups who are affected by or can affect those parts of the system (this may include non-human and non-living entities and future generations), and; (iii) prioritises these individuals and groups for involvement in the decision-making process (Reed et al., submitted for publication). This definition draws together ideas that have evolved in parallel from business management, natural resource management and development studies.

A wide variety of tools and approaches have been used for stakeholder analysis in these disciplines and in different contexts. These can be categorised as methods used for: (i) identifying stakeholders; (ii) differentiating between and categorising stakeholders; and (iii) investigating relationships between stakeholders (Reed et al., submitted for publication). Whilst some methods may be used for more than one purpose (for example, Social Network Analysis is primarily used to investigate relationships between stakeholders, but can also be used to categorise them; Prell et al., in press-a and b) most are generally used for one of the three purposes identified above. Due to the time involved, practitioners rarely use all three types of methods, focussing instead on identifying and sometimes categorising stakeholders.

Where there is considerable documentary evidence or where analysts have an intimate knowledge of the individuals and groups with a stake in the system under investigation (e.g. an organisation, intervention, or issue), the stakeholder analysis can be conducted without the active participation of the stakeholders themselves (Reed et al., submitted for publication). However, participation may be necessary if it is unclear which issues are most pertinent to the investigation, or if there is incomplete knowledge on the population from which the stakeholders could be drawn. The level of participation in stakeholder analysis can also vary considerably. This may consist of passive consultation, where stakeholders simply provide information for the analysis. It may extend to active engagement, where there is a two-way exchange of information between stakeholders and analysts as equal partners, in a process which is designed to allow stakeholders to influence who is included in the analysis.

Much of the stakeholder analysis literature has presumed that stakeholders are self-evident and self-construed, and has focused on categorising existing stakeholders to understand their interests and relationships (e.g. Mitchell et al., 1997; Frooman, 1999). However, before this can be done, it is necessary to identify who holds a stake in the system under investigation (Reed et al., submitted for publication). This in itself necessitates a clear understanding of the research question, so that the boundaries of the social and ecological system can be established. From this clarification, a number of methods can then be used to identify the relevant stakeholders. Identifying stakeholders is usually an iterative process, where stakeholders are added as the analysis continues, for example, using expert opinion, focus groups, semi-structured interviews, snowball sampling, or a combination of these methods. If the system and its boundaries are clearly defined, then stakeholders can be relatively easily identified. However, there is a risk that some stakeholders are omitted and as a consequence not all relevant stakeholders in the system may be identified (Clarkson, 1995). On the other hand, it is often not possible to include all stakeholders and it is necessary to draw a line at some point, based on pre-determined and well-defined decision criteria.

Once the stakeholders have been identified, there are also a range of methods that have been developed to characterise and classify them. These tend to follow two broad approaches: (i) top-down "analytical categorisations" where stakeholders are classified by researchers based on their observations of the system in question and 'embedded in some theoretical perspective on how a system functions' (Hare and Pahl-Wostl, 2002, p. 50) and; (ii) bottom-up "reconstructive methods" which allow the categorizations and parameters in a stakeholder analysis to be defined by the stakeholders themselves, so that the stakeholder analysis better reflects the perceptions of the stakeholders themselves (Dryzeck and Berejikian, 1993; Hare and Pahl-Wostl, 2002). For details, see Reed et al., submitted for publication. Examples of categorisation tools include interest-influence matrices, where stakeholders are placed in a matrix on the basis of the extent to which they are interested in or can influence the issue under investigation. Venn diagrams may also be used with stakeholders to explore the extent to which the characteristics of different groups overlap (Reed et al., submitted for publication).

Finally, there are a collection of methods that have been developed to investigate the relationships that exist between stakeholders (as individuals and groups) in the context of a particular system. There are two principal methods that have been used to analyse stakeholder relationships: (i) Social Network Analysis provides insights into patterns of communication, trust and influence between actors in social networks, and; (ii) Knowledge Mapping analyses the flows of information between these actors (Reed et al., submitted for publication).

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2.3. *Clear objectives for the participatory process need to be agreed among stakeholders at the outset*

In order to design an appropriate process using relevant tools, it is essential to clearly articulate the goals towards which the group will be working: "as with any analysis, well-formulated questions are more likely to generate robust answers" (Lynam et al., 2007; online). This is closely linked to stakeholder analysis and may take place as part of such an analysis, where system boundaries and issues are identified alongside those who hold a stake in what happens to the system under investigation (Reed et al., submitted for publication). This may require negotiation, and different stakeholders may have irreconcilable objectives (Chess and Purcell, 1999).

Although it is often assumed that the objective of stakeholder dialogue should be to build consensus[1] Susskind and Field, 1996; Susskind et al., 2003), such an emphasis can suppress diversity of opinion and values, and lead to a focus on general principles (rather than operational decisions) and easily solved but often less important problems (van de Kerkhof, 2006): "the ultimate goal shifts away from reaching a quality decision and moves it towards reaching an agreeable one" (Coglianese, 1999, p. 4). In this context, Steinman et al. (2002, online) suggest that rather than seeking consensus, participatory processes should adopt the "shared adversity principle" in which recognises that trade-offs are inherent to decision-making. This more deliberative approach focuses on communication and argumentation rather than negotiation, exploring the diversity of positions and assumptions held by the participants (Dryzek, 2000; Renn, 2004). Taking a deliberative approach, participants define the problems and establish the purpose of their dialogue reflectively. This is particularly important because problem definition and problem solving are closely linked, with the construction of a problem already pointing to perceived solutions (Dunn, 1988). If the goals are developed through dialogue (making trade-offs where necessary) between participants, they are more likely to take ownership of the process, partnership building will be more likely, and the outcomes are more likely to be more relevant to stakeholder needs and priorities, motivating their ongoing active engagement (Johnson et al., 2004; Lynam et al., 2007).

Of course, this discussion assumes that engagement is in fact necessary. It is only by defining clear objectives that it will be possible to determine the appropriate level of engagement, who should be engaged, and how best to engage them.

2.4. *Methods should be selected and tailored to the decision-making context, considering the objectives, type of participants and appropriate level of engagement*

Participatory methods can only be chosen once the objectives of the process have been clearly articulated, a level of engagement has been identified that is appropriate to those objectives, and relevant stakeholders have been selected for inclusion in the process.

The level of engagement is a major factor determining the methods that are likely to be most relevant. Most typologies of participation suggest methods that are appropriate to different levels of engagement. For example, Arstein (1969), Biggs (1989) and Pretty (1995a,b) suggest methods for the different rungs of their ladder of participation. Similarly, Richards et al. (2004) suggest methods appropriate to the different levels of engagement on a wheel of participation, to emphasise the relevance of different levels for different purposes and contexts. Rowe and Frewer (2000) identify and review a wide range of methods that can be used to communicate (e.g. information dissemination via leaflets or the mass media, hotlines and public meetings), consult (e.g. consultation documents, opinion polls and referendums, focus groups and surveys) or participate (e.g. citizen's juries, consensus conferences, task-forces and public meetings with voting) with stakeholders. Tippett et al., 2007 provides a useful review of participatory process designs, and a wide range of tools and methods have been reviewed elsewhere, for example: Pretty (1995a,b), Rietbergen-McCracken and Narayan (1996), Davies (1997), Rennie and Singh (1996), New Economics Foundation (1998), Shah et al. (1999), Galpin et al. (2000), Wates (2000), OECD (2001), Chambers (2002), DFID (2002), European Commission (2002), Jayakaran (2003), Home Office (2004), International Association for Public Participation (2004), Scottish Parliament (2004), Involve (2005), Mayoux (2005), Mikkelsen (2005), and Tippett et al. (2007).

Methods must also be adapted to the decision-making context, including socio-cultural and environmental factors. For example, methods that require participants to read or write should be avoided in groups that might include illiterate participants. The amount of time that participants are likely to give up varies between cultures, and limited time may constrain the choice of methods. Equally, the resources available may also limit this choice. Depending on the power dynamics of the group, methods may need to be employed that equalise power between participants to avoid marginalising the voices of the less powerful. There is evidence that less powerful actors who are marginalised during decision-making can delay or prevent implementation through litigation (Cupps, 1977; Turner and Weninger, 2005). Where it is necessary to work with participants outdoors, methods may have to be adapted, for example drawing in the sand instead of using flip-chart paper. For example, a cultural taboo prevents women from speaking when men are present in village Kgotlas (a fenced area usually under a tree, equivalent in function to a village hall) in Botswana, so Reed et al. (in press) held separate focus groups for men and women. Participatory mapping was conducted with participants drawing in the sand before maps were transferred to paper and checked by vehicle with a Global Positioning System.

Finally, methods must be adapted to the relevant stage in the process and to changing contexts (Richards et al., 2004). For example, different methods will be appropriate for encouraging engagement in the process, compared to evaluating the outcome. Being able and prepared to use a range of tools can enable the facilitator to adapt to changing circumstances such as the last minute discovery that a participant has a disability that precludes participation in a certain activity, or a change in an objective that has become irrelevant due to changes external to the process. For example, Dougill et al. (2006) had to replace multi-criteria evaluation with structured discussion when it became apparent that some of the participants were illiterate.

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2.5. *Highly skilled facilitation is essential*

The outcome of any participatory process is far more sensitive to the manner in which it is conducted than the tools that are used (Chess and Purcell, 1999; Richards et al., 2004). Highly skilled facilitation is particular important for conservation, given the high likelihood of dealing with conflict, for example between conservationists and resource users (e.g. Bojorquez-Tapia et al., 2004). Different facilitators can use the same tools with radically different outcomes, depending on their skill level. Such skills include technical expertise in the use of different tools. However, it is sometimes the most seemingly simple of methods, such as informal group discussion, which require the greatest expertise. A successful facilitator needs to be perceived as impartial, open to multiple perspectives and approachable. They need to be capable of maintaining positive group dynamics, handling dominating or offensive individuals, encourage participants to question assumptions and re-evaluate entrenched positions, and get the most out of reticent individuals. Such skills are difficult to learn and tend to be developed through years of experience, intuition and empathy (Richards et al., 2004).

Various techniques have been developed to aid facilitation, including the development of ground rules that groups agree to follow, meticulous planning, psychological approaches to deal with difficult individuals and group dynamics, and being familiar with a wide range of alternative tools that can be adapted to the circumstances (Chess and Purcell, 1999; Richards et al., 2004). By reflecting on feedback from participants about the facilitation of participatory processes, it is possible to refine personal practice over time, but there is no substitute for experience.

2.6. *Local and scientific knowledges should be integrated*

The need for scientific information and analysis to inform stakeholder deliberation has been identified by many authors as an essential ingredient in any participatory process (e.g. Chess et al., 1998, 1999; Johnson et al., 2004; Chase et al., 2004; Webler et al., 2006; Fischer and Young, 2007; Tippett et al., 2007). In highly technical decision-making contexts this may serve an educational purpose (point 1 above). However, there is also a danger that unless carefully balanced, such information may bias decisions. For example Broad et al. (2007) describes Water Allocation Committees who met every month to discuss a narrow and conservative range of water discharge scenarios developed by a Government agency, and points to the need for stakeholder involvement in scenario develop to derive less biased options. In contrast, Prell et al. (2007) developed preparatory material in collaboration with stakeholders who discussed the scope and reviewed content prior to the workshops in which the materials were used. In combination with local knowledge, scientific knowledge can contribute to a more comprehensive understanding of complex and dynamic natural systems and processes. By triangulating different local and scientific knowledge sources, it may be possible to investigate uncertainties and assumptions and develop a more rigorous understanding as well (Johnson et al., 2004). Following from this, it is argued that decisions based on such knowledge are likely to be more robust (Hansen, 1994; Reed et al., 2006; Stringer and Reed, 2007; Reed et al., 2007, in press).

Participatory approaches were developed in part, as a response to the top-down, science-led transfer of technology paradigm (Section 2.1). By tapping into local knowledge, it was argued, more complete information could lead to more robust solutions to environmental problems. However, just as the participatory paradigm questioned the validity of technical approaches, so local knowledge cannot be unquestioningly accepted. Instead, there is a growing body of literature suggesting that a combination of local and scientific knowledge may empower local communities to monitor and manage environmental change easily and accurately (e.g. Reed and Dougill, 2002; Thomas and Twyman, 2004; Stringer and Reed, 2007; Reed et al., 2007, in press; Ingram, 2008). Scientific knowledge is typically understood to be explicit, systematised, decontextualised and hence widely transferable (Norgaard, 1984; Ingram, 2008). Lundvall and Johnson (1994) refer to this as "know-why", since scientific knowledge partly attempts to understand the underlying principles and theory behind observable phenomena. They contrast this with the "know-how" of local knowledge ("practical knowledge" according to Thrift, 1985), that is primarily tacit, implicit, informal, context dependant, resulting from the collective experience of generations of observation and practice (Ingram, 2008). Stringer and Reed (2007) argue that by hybridising these knowledges (Forsyth 1996; Nygren 1999) it may be possible for researchers and local communities, with their different understandings, to interact in order to produce more relevant and effective environmental policy and practice. In a growing number of cases, this has involved researchers and communities working together from proposal development through fieldwork to analysis and completion. For example, rather than simply using local people as data collectors (e.g. Caputo et al., 2005), Reed et al. (in press) point out the benefits of working more closely together. Communities in this study provided expert assistance with species identification, local plant names and provided valuable ethnobotanical data, including the palatability of certain plants for specific livestock species.

On the other hand, it has been suggested that local knowledge may be exaggerated or distorted, and irrelevant to scientific nature of much modern conservation management (Molnar et al., 1992; Richards, 1993; Morgan and Murdoch, 2000). On this basis, concerns have been expressed that integrating scientific and local knowledge bases will inevitably involve a trade-off between meaningful participation and scientific rigour (Abbot and Guijt, 1997). Reed et al. (in press) evaluated this hypothesis by empirically testing indicators of land degradation elicited from pastoralists in the Kalahari, Botswana. They found considerable overlap between scientific literature and local knowledge, and the results of empirical testing suggested that such a trade-off was by no means inevitable. Many of the indicators traditionally used by researchers could not be used by non-specialists, and it was not possible to find empirical evidence to support all indicators suggested by pastoralists. However, there were a considerable number of indicators representing a wide range of system components that had a clear empirical basis and that could be used effectively by non-specialists to monitor and respond to environmental change.

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In Western societies, Ingram (2008) argues that the overlap between these knowledge bases may be due to the direct assimilation of scientific knowledge by practitioners, often through extension services, that is necessary to incorporate advanced technologies into their practice. Indeed, there is often a fine line between ongoing experimentation by farmers designed to enhance their own practice, and scientific experimentation (Wilson, 1997; Harrison et al., 1998; Tsouvalis et al., 2000). This has led some to suggest that not only are these knowledge bases fundamentally compatible (Romig et al., 1995; Walter et al., 1997); but that all knowledge comprises a heterogeneous blend of tacit and implicit knowledges from different sources that is impossible to disentangle (Long, 1992; Murdoch and Clark, 1994; Clark and Murdoch, 1997).

Recently, this debate has gained momentum through growing interest in "knowledge transfer/exchange" between knowledge producers (typically researchers) and user (typically stakeholders). Although this has traditionally focussed on one-way transfer of knowledge (e.g. the commercialisation of research outputs), interest is shifting towards more collaborative approaches (where knowledge producers and users communicate and influence each other throughout the research process) and the joint production of knowledge (where multiple forms of expertise, for example from researchers, practitioners and the public, are valued equally in the production of knowledge) (Phillipson and Liddon, 2007).

2.7. *Participation needs to be institutionalised*

Finally, the long-term success of participatory processes may depend on institutionally embedding stakeholder participation. Although participation is increasingly becoming embedded in policy, the requirements of participatory processes are at variance with many of the institutional structures of the organisations charged with implementing these policies. Many of the limitations experienced in participatory processes have their roots in the organisational cultures of those who sponsor or participate in them. For example, although non-negotiable positions are often the result of regulatory constraints, they may simply be the result of pre-determined positions decided at higher levels within the organisation prior to participation in the process, that representatives do not feel able to negotiate. Decision-makers may feel uncomfortable committing themselves to implement and resource the as-yet unknown outcome of a participatory process. In many cases, to do so would represent a radical shift in the organisational culture of government agencies and other institutions. Richards et al. (2004, p. 18) argue that this requires significant and urgent institutional reform: "if participation is a democratic right, not just a normative goal, then participation must be institutionalised".

3. Conclusion

Although few of the claims that are made for stakeholder participation have been tested, there is evidence that it can enhance the quality of environmental decisions, possibly due to more comprehensive information inputs. However, the quality of decisions made through stakeholder participation is strongly dependant on the nature of the process leading to them. Deficiencies in this process are most commonly blamed for the failures that have led to disillusionment in stakeholder participation. Often this has arisen from a focus on the tools of participation, rather than the process within which those tools are used. However, by focussing on participation as a process, this review has identified a number of best practice features from the literature. A range of typologies have been developed to understand the basis for stakeholder participation and can be used to select and tailor methods to the decision-making context, considering the objectives, type of participants and appropriate level of engagement. It is argued that stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning. Where relevant, participation should be considered as early as possible and throughout the process, representing relevant stakeholders systematically. The process needs to have clear objectives from the outset, and should not overlook the need for highly skilled facilitation. Local and scientific knowledges can be integrated to provide a more comprehensive understanding of complex and dynamic natural systems and processes. Such knowledge can also be used to evaluate the appropriateness of potential technical and local solutions to environmental problems. Finally, it has argued that to overcome many of its limitations, stakeholder participation must be institutionalised, creating organisational cultures that can facilitate processes where goals are negotiated and outcomes are necessarily uncertain. In this light, participatory processes may seem very risky, but there is growing evidence that if well designed, these perceived risks may be well worth taking.

In order to design more effective and appropriate participatory processes, research is needed to better understand and prioritise the factors that make stakeholder participation lead to stronger and more durable decisions in different contexts. There is a need to replicate and compare participatory processes in different socio-cultural and biophysical contexts, and to compare participatory processes applied using different approaches and methods in similar contexts. Building on the sorts of best practice lessons emerging from this review, such analyses need to work with stakeholders to systematically evaluate participatory processes against criteria derived from both theory and from the stakeholders themselves. As participation is increasingly institutionalised, there will be more opportunities to make such systematic comparisons. For example, the EU Framework 6 Integrated Project, "Desertification Mitigation and Remediation of Land" (DESIRE) is one example of researchers responding to the progressive institutionalisation of participation in international research funding. The project is replicating a participatory process in parallel with stakeholders in 18 desertification hotspots in very different socio-cultural and biophysical contexts around the world (http://www.desire-project.eu/). However, the institutionalisation of participation in research funding agendas, as elsewhere, needs to go beyond increasing the incentives for participation, to enable stakeholders to influence or alter the questions that are asked and the outputs that are produced. Creative solutions are being developed to address this challenge, for example the RELU programme's seed-corn funding, but such approaches need to be increas-

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ingly mainstreamed if stakeholders are to meaningfully participate in and enhance environmental decision-making.

Although there is evidence that stakeholder participation can lead to more effective and durable decisions, there is little empirical evidence to support many of the other claims that have been made. Future research needs to evaluate whether decisions emerging from participatory processes are perceived to be more holistic and representative of diverse values and needs, and whether this has the capacity to enhance public trust in the decision-making process. Despite a growing literature, there is little evidence to support claims that stakeholder participation in environmental decision-making can promote or enhance social learning. To an extent, this is limited by the absence of adequate methods to quantify social learning. Prell et al. (in press-a and b) suggest that if social learning can be considered as the learning that takes place through social networks, then Social Network Analysis may offer a way forward. However, this is one of the first attempts to quantify social learning through stakeholder participation, and more work is necessary to combine insights from quantitative sociology with more qualitative data about the extent to which stakeholders' underlying assumptions and attitudes are altered through participation. There are also pragmatic claims that need to be more rigorously tested, including the capacity for participation to increase the adoption and diffusion of innovations that better meet local needs, and the capacity for participation to transform adversarial relationships between stakeholders.

4. Uncited references

Q9 Bühler et al. (2002); Pellizzoni (2003).

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