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Accessing the environment: Delivering ecological and societal benefits through knowledge integration – The case of water management

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ABSTRACT

Recent 'soft engineering' approaches to river management have fostered the call for river research and management to be application specific, inclusive of those who possess knowledge which is not traditionally scientific and to provide users with their democratic right to be involved in decision-making processes. The benefits of public involvement in river management and research have been widely publicised, although uptake of public participation at the prescribed higher levels (which account for both ecological and societal benefits, and include knowledge production and decision-making by 'non-certified experts') is rarely evident. It is suggested that this may be caused, in part, by the difficulty of, and lack of guidance on, how to integrate diverse knowledges, perspectives and needs. This project builds on an associated study which identified organisational issues in implementing high-level participation for river management. The focus of this paper is a study located on the River Derwent, Northumberland, UK, which aimed to examine the role of integrating different types of knowledge for a reach scale problem in order to gain holistic perspectives of water management needs which consider both social communities and ecology. The merits of the approach were considered for improving access to the fluvial environment for the participants and researchers concerned. The study examines the role of integrating traditional river research methods (hydraulic modelling) with experiential knowledge in order to both answer ecological questions in river management, and deliver societal benefits through processes of social learning. As well as identifying the controls on levels of participation, the process opened up the decision-making and management processes to 'non-experts'. Participants improved their own access to their fluvial environment through an understanding of localised river processes and an increased confidence in a knowledge which they had deliberated and validated through the process of co-production. The study demonstrated that heterogeneous knowledge types are necessary for holistic system understandings, that knowledge integration processes need to be reflexive, and that motives for knowledge integration should be both pragmatic and normative.

Introduction

Restoration and management of a river corridor may occur for a number of reasons, including flood risk management, fisheries management, water diversion, land reclamation, commerce and development (Gilvear, Casas-Mulet, & Spray, 2012). For many decades, river management has been dominated by hard engineering approaches (Newson, 2012), traditionally based on knowledge and data provided by certified experts. Within river research (and broader scientific research), knowledge that was produced was done so in response to personal interest, without application to a specific context, and was exclusively for the 'scientists', with members of the public hoping to be, at best, *informed* (Callon, 1999; Gibbons et al., 1994) of research findings or management activities. More recently, there has been a shift in management approach, in which softer engineering approaches (Newson, 2012), have been adopted which aim to work with the river and the riparian environment, rather than to control it. This change has occurred in response to new attitudes towards research and management, which suggest that research should be application specific, answerable to those whom it affects and inclusive of those who possess knowledge which is not traditionally scientific (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2001). Additionally, the

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emergence of the argument that the public have a democratic right (e.g. Jasanoff, 2004; Reed, 2008) to be involved in management decisions which affect their homes, livelihoods and communities has been reflected in policy and planning guidelines (most notably for the UK and Europe, in the Water Framework Directive: WFD) and the value of 'public knowledge' has been highlighted. Subsequently, a wealth of literature has promoted (and to some degree demonstrated) the benefits of public involvement in river management and research (e.g. Blackstock, Kelly, & Horsey, 2007; Henriksen et al., 2009; Lebel, Nikitina, Pahl-Wostl, & Knieper, 2013; Robinson, Taylor, Vella, & Wallington, 2014), yet still, uptake of public participation at the prescribed higher levels[1] remains rare in practice (Cook, Kesby, Fazey, & Spray, 2013), although exceptions are emerging (see Lane et al., 2011; Tsouvalis & Waterton, 2012). This higher level approach may involve affording participants more control in decision-making, and the creation of new knowledges and understanding about a system or process through a deliberation process which allows all participants to frame and re-frame information within their own context of understanding. Actioning the 'right' of non-certified experts and members of the public to have access to knowledge production and decision-making processes does not preclude practitioners from delivering the rights of nature. Indeed, the aim of participatory knowledge production processes is not simply to ensure socially acceptable outcomes, but to do so within the framework of environmentally beneficial activities – i.e. making decisions which deliver mutually beneficial outcomes for ecological and social systems. Environmental management organisations exist to protect and maintain the environment (often through the implementation of national and international legislation such as the EU Water Framework Directive and the EU Habitats Directive, among others). Participation is considered by such legislation to *enhance* the ecological benefits of a management process by identifying the local characteristics and needs of an ecological environment.

Social and ecological systems cannot be delineated (Berkes & Folke, 1998). As a complex adaptive system, rivers and the social environments in which they exist demonstrate powerful reciprocal feedbacks (Folke, Hahn, Olsson, & Norberg, 2005) and the components cannot be considered in isolation as each underpins the other. Physical processes within a catchment are interlinked and one alteration in the system can have complex implications (Grabowski, Surian, & Gurnell, 2014) which affect both other physical components (e.g. a decrease in flow rate may reduce sediment transportation rates) and social components (e.g. reduced sediment transportation rates result in deposition, reduction in channel capacity and increased flood risk). In order to understand the implications of one seemingly simple change, a holistic understanding of the catchment and its complexities must be achieved and this requires the integration of a number of perspectives and knowledge types. Furthermore, the implications of analysis for what is considered to be seen as a social-ecological system tend to differ from the implications of analysis of a social or an ecological system alone (Folke et al., 2005). For example, maintaining a river pool, while effective in delaying flood flows, may have negative implications for fish passage and habitat availability. By addressing multiple concerns and working with a range of interests, the complexities of a system can be defined and accommodated within the development of solutions and a social-ecological environment may become more resilient through the ability of the social component to understand, embrace and cope with change (e.g. Holling, 1978 p. 7; 135). Therefore, effective decision-making in river management, which delivers both social and ecological benefits, must be focused on reflexivity, contextuality, substance and engagement (Lane, Brookes, Heathwaite, & Reaney, 2006).

Further to the fundamental benefits of river management (e.g. reduction of flood risk or ensuring adequate water resources), there are benefits aligned with effective decision-making and 'opening-up' the process of river management which are less quantifiable but equally important in terms of community governance and responsibility for environmental systems. In terms of environmental justice, increasing access to the environment for those affected by its management (stakeholders, public, ecology) addresses a number of forms of environmental justice (*distribution, recognition* and *participation*, as set out by Allen & Frediani, 2013; Schlosberg, 2007). While participation as a form of environmental justice in this context is self-explanatory, distribution is also an important aspect of environmental justice which can be addressed through high-level participation. Such an approach addresses the 'structural distributive conditions' (Allen & Frediani, 2013) which lead to environmental management aimed at meeting the needs of both the ecological and societal dimensions of the system. In other words, they allow a fairer distribution of rights in environmental management, advancing the right to the river environment through the knowledge production process (cf. Allen & Frediani, 2013). In such circumstances, those people who are part of the environment in question are also the ones who deliver the social and ecological benefits (often in collaboration with technical experts and environmental managers).

Higher level participation, as outlined above, lends itself to a constructive process of double-loop learning (e.g. Brewer, 2013; Tippett, Searle, Pahl-Wostl, & Rees, 2005), which allows a group or community to use a participatory river management process to learn, reflect on its outcomes and adjust its behaviour for the benefit of the ecology and the community. In such a process, members of the community and 'certified' experts alike, become guardians of the environment. In order to achieve this integrated form of learning, the process of decision-making must be opened up to experts of all types (rather than solely 'certified' experts: see Lane et al., 2011) and those not traditionally involved in decision-making and knowledge production must be given access to the process. The concept of opening-up a knowledge production process to non-certified experts has been the topic of much debate and is presented through a number of knowledge production theories, such as the *Mode 1/Mode 2* theory (Gibbons et al., 1994; Nowotny et al., 2001). Gibbons et al. (1994) and Nowotny et al. (2001) describe the progression of knowledge production approaches from Mode 1 to Mode 2, in response to transformation of the 'funding and organisation of science' in the mid 1990s (Mirowski & Sent, 2008, 667). Mode 2, the more progressive and inclusive process of knowledge production is considered to have five defining characteristics. Processes have a *context of application* rather than being limited to an academic context. In Mode 1, knowledge acquires its application after it is created, requiring a 'knowledge transfer' from 'more qualified' to 'less qualified' participants, while in Mode 2, knowledge is developed in response to the application

[1] Higher level participation is a form of participation which affords some level of control in a process to appropriate members of the public, during knowledge production and/or decision-making processes. There are a number of models of participation which describe degrees of involvement. One of the most common is that of Arnstein (1969). In this model, 'higher level participation' would be anything upward of the 'partnership' category – i.e. a situation in which stakeholders are given the *opportunity to negotiate with traditional power holders*. Beyond this is 'Delegated Power', allowing stakeholders to *share decision-making responsibilities with the government* (or appropriate governing body). This level of influence may increase as far as Arnstein's 'Citizen Control', in which stakeholders have full managerial control (although there are clear limitations to this level of control in environmental management situations). For the purposes of this study, higher level participation is considered to be a degree of involvement of non-certified experts which can lead to the production of Mode 2 knowledge, as outlined by Gibbons et al., 1994.