

Research, part of a Special Feature on [Social Learning in Water Resources Management](#)
Social Learning and Water Resources Management

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ABSTRACT. Natural resources management in general, and water resources management in particular, are currently undergoing a major paradigm shift. Management practices have largely been developed and implemented by experts using technical means based on designing systems that can be predicted and controlled. In recent years, stakeholder involvement has gained increasing importance. Collaborative governance is considered to be more appropriate for integrated and adaptive management regimes needed to cope with the complexity of social-ecological systems. The paper presents a concept for social learning and collaborative governance developed in the European project HarmoniCOP (Harmonizing Collaborative Planning). The concept is rooted in the more interpretive strands of the social sciences emphasizing the context dependence of knowledge. The role of frames and boundary management in processes of learning at different levels and time scales is investigated. The foundation of social learning as investigated in the HarmoniCOP project is multiparty collaboration processes that are perceived to be the nuclei of learning processes. Such processes take place in networks or “communities of practice” and are influenced by the governance structure in which they are embedded. Requirements for social learning include institutional settings that guarantee some degree of stability and certainty without being rigid and inflexible. Our analyses, which are based on conceptual considerations and empirical insights, suggest that the development of such institutional settings involves continued processes of social learning. In these processes, stakeholders at different scales are connected in flexible networks that allow them to develop the capacity and trust they need to collaborate in a wide range of formal and informal relationships ranging from formal legal structures and contracts to informal, voluntary agreements.

Key Words: *social learning; collaborative governance; adaptive management; water resources*

INTRODUCTION

Natural resources management in general, and water resources management in particular, are currently undergoing a major paradigm shift (Cortner and Moote 1993, Ward 1995, Gleick 2003, Pahl-Wostl 2007a,b). Until recently, management was often the exclusive task of technical experts working under the auspices of the state. Their activities were based on the assumption that water and natural resources can be predicted and controlled, notably by means of infrastructural works. At the moment, however, participatory management and stakeholder involvement are becoming increasingly important (Global Development Research Center 1992, Global Water Partnership 2000, Mostert 2003, Bouwen and Taillieu 2004, Pahl-Wostl 2002a, 2007a). Moreover, awareness of uncertainty and change is increasing. New

management practices that involve many stakeholders must be adopted. A particular group of experts or stakeholders can no longer learn on behalf of all other stakeholders (cf. Pahl-Wostl 2007a). Instead, “social learning” is needed. This paper will present the social learning concept developed in the European HarmoniCOP (Harmonizing Collaborative Planning) project described in more detail below.

Collaboration

In recent years, the notion of government as the only decision-making authority has been replaced by multiscale, polycentric governance, which recognizes that a large number of stakeholders in different institutional settings contribute to the overall management of a resource. This change reflects a more general trend in public policy away from the

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hierarchical model, in which state authorities exert sovereign control over the people and groups making up civil society (Mayntz 1998). Instead, a basically nonhierarchical mode of governing is promoted in which different stakeholders, e.g., government bodies, companies, interest groups, and individuals, collaborate in the formulation and implementation of public policy (Rhodes 1997).

There are different motives for increasing stakeholder involvement. One argument based on democratic legitimacy emphasizes that all those who are influenced by management decisions should be given the opportunity to actively participate in the decision-making process. Principles of equity and social fairness demand that the voices of the less powerful should also be heard (e.g., REC 1998, 1999, Renn et al. 1995; C. Pahl-Wostl and D. Ridder, *unpublished manuscript*). A pragmatic approach is to build on the insight that complex issues and integrated management approaches cannot be tackled without taking into account stakeholders' information and perspectives and without their collaboration. Interdependence between government bodies and other stakeholders is increasing because of, for instance, decreasing government budgets that reduce the efficacy of the traditional command-and-control management style. Collective decisions are needed to implement effective management strategies, and the combination of top-down and bottom-up formation of institutional arrangements may lead to a greater acceptance by all the stakeholders involved.

This paper follows a pragmatic approach, albeit recognizing that effectiveness and legitimacy are related, and tries to provide evidence for the need for social learning processes that can cope with complex resource management problems. Social learning is analyzed as a means of developing and sustaining the capacity of different authorities, experts, interest groups, and the general public to manage their river basins effectively. This includes the capacity to deal effectively with differences in perspective, to solve conflicts, to make and implement collective decisions, and to learn from experience.

Uncertainty and change

Some insightful examples for the importance of participatory governance come from the area of adaptive management. Adaptive management first

focused on ecosystems but has increasingly embraced the importance of the human dimension (e.g., Berkes and Folke 1998, Lee 1999). Several authors emphasize the need for a shift toward adaptive co-management of social-ecological systems in which cooperation among a wide range of stakeholders and institutions is necessary. Hence, adaptive co-management combines the dynamic learning characteristic of adaptive management with the linkage characteristic of cooperative management (e.g., Berkes et al. 1998). Folke et al. (2003, 2005) explored the dimensions and the nature of governance that enable adaptive ecosystem-based management and identified the four critical factors for dealing with social-ecological dynamics during periods of rapid change and reorganization:

1. Learning to live with change and uncertainty.
2. Combining different types of knowledge for learning.
3. Creating opportunities for self-organization toward social-ecological resilience.
4. Nurturing sources of resilience for renewal and reorganization.

They emphasize the role of networks, sense making, leadership, diversity, and trust as well as the role of organizations capable of accumulating the experiences and collective memory they need to cope with surprise and turbulence. Bridging institutions play a major role in strengthening the generation of social capital and creating new opportunities and multilevel cooperation and learning. The question arises of how these characteristics are developed and sustained.

Factors such as climate change, the rapid dynamics of socioeconomic development, and globalization are increasing the amount of uncertainty faced by managers from regional to global scales. This requires a more adaptive and flexible management approach that can speed up the learning cycle to allow for more rapid assessment and implementation of the consequences of new insights. This type of adaptive manager needs new skills and capabilities, informal and flexible management structures, and access to expert knowledge as well as local lay knowledge.

Folke et al. (2003) point out that social learning is essential for building up the experience needed to

cope with uncertainty and change. They emphasize that “... knowledge generation in itself is not sufficient for building adaptive capacity [...] to meet the challenge of navigating nature’s dynamics ...” and conclude that “... learning how to sustain social-ecological systems in a world of continuous change needs an institutional and social context within which to develop and act.” Such findings support this paper’s concept of social learning and knowledge as participation. Knowledge and the ability to act upon new insights are continuously questioned, applied, and regenerated or expressed alternatively in social processes. The social network of stakeholders is an invaluable asset for dealing with change. A similar argument was made by Tompkins and Adger (2004). They pointed out that community-based management enhances adaptive capacity in two ways: by building networks that are important for coping with extreme events and by retaining the resilience of the underpinning resources and ecological systems. Social learning increases adaptive capacity and leads to sustained processes of attitudinal and behavioral change by individuals in social environments through interaction and deliberation.

This paper

This paper develops the social learning concept as envisioned in the European project HarmoniCOP. The main objectives of HarmoniCOP were to increase the understanding of participatory river basin management in Europe, to generate practically useful information about and improve the scientific base of social learning and the role of information and communication technology (ICT) tools in river basin management, and to support the implementation of the European Water Framework Directive. The first step was the development of a conceptual approach for social learning and the role of ICT tools. These concepts served as the basis of a design for empirical studies in 10 case studies across Europe. More information on the HarmoniCOP project is available on their Web site at www.harmonicop.info.

The current paper focuses on the conceptual foundations of social learning. The next section introduces social learning as a group process, embedded in a structural governance context that influences and is influenced by this process. The subsequent sections focus on multiparty processes and structural change. Details on the major insights

of the empirical results of the work are reported elsewhere (Tippet et al. 2005, Mostert et al. 2007).

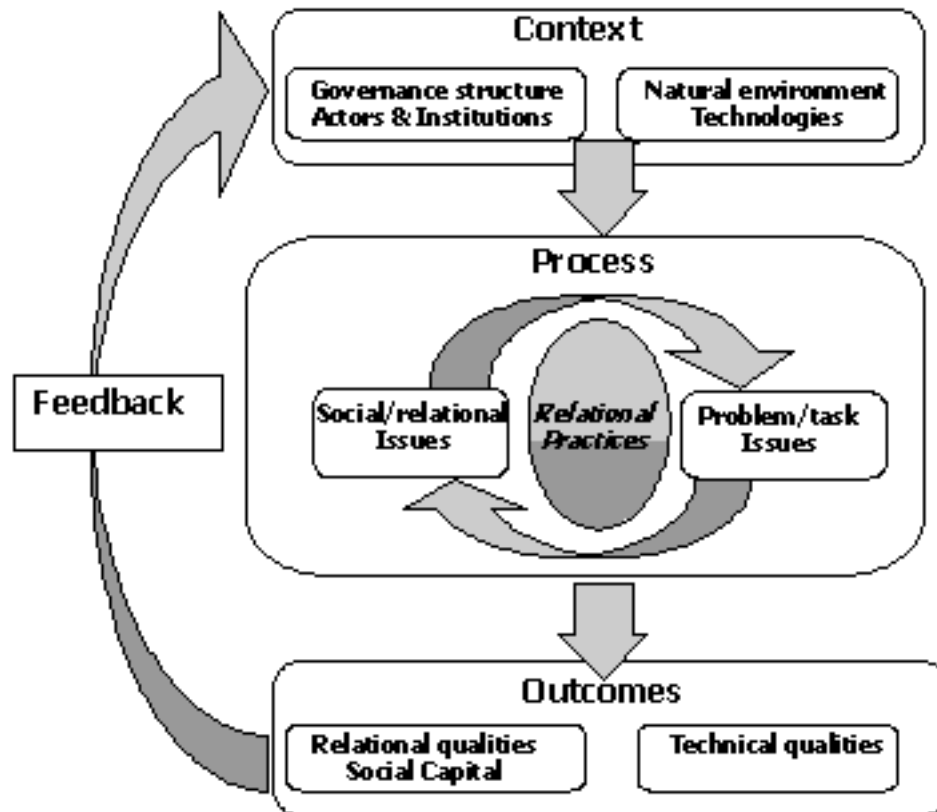
SOCIAL LEARNING CONCEPTS

Social learning has become quite a popular term in the literature on natural resource management and has been used to refer to all kinds of processes of learning and change. As a consequence, its meaning has become quite vague. Originally, social learning referred to the learning of individuals in a social environment by observation and imitation of others (Bandura 1977). Because it focuses on the cognitive processes of individuals, the original concept does not consider group processes such as the development of shared meanings and values that provide a basis for joint action. As pointed out by Röling (2002), it is necessary to move from individual “multiple cognitions” to interrelated “distributed cognition” and to an understanding of group processes to capture the essence of social learning. Learning concepts applied to whole social entities can be found mainly in work on organizational learning such as Argyris and Schön (1978, 1996), Senge (1990), and Wenger (1998). Such concepts emphasize the development of shared meanings and practices that characterize the social entity as a whole.

The HarmoniCOP (Harmonizing Collaborative Planning) project developed a new conceptual framework to capture the essential processes of multilevel social learning in river basin management. The focus is on the learning of the social entity as a whole. The framework is characterized by a broad understanding of social learning that is rooted in the more interpretative strands of the social sciences. The key message of “learning together to manage together” also sheds new light on the understanding of the management process (Bouwen and Taillieu 2004, Pahl-Wostl 2002a, 2006, Craps 2003). The framework for this type of learning is provided by multiparty collaboration embedded in a specific context and leading to specific outcomes. A feedback loop between outcomes and context takes into account structural changes in a cyclic and iterative fashion (Fig. 1).

The context of social learning includes the governance structure and the natural environment in a river basin. The governance structure includes the pertinent legal and organizational framework as

Fig. 1. Conceptual framework for social learning in resources management. In the center are multiparty processes that are influenced by the context in which they are embedded and produce outcomes that may lead to changes in the context and thus to a cyclic and iterative process of change.



well as the cultural and socioeconomic environment. The governance structure has a strong influence on the nature of multiparty cooperation and social learning processes. Results from empirical analyses show, for example, that centralized political and economic systems, privatization, commercialization of the environment, rigid bureaucratic systems, and political secrecy and poor public access to information can impede social learning (Tippet et al. 2005, Mostert et al. 2007). Environmental improvement may require a long-term change in the governance structure that may have to be brought about in a stepwise and incremental manner.

Multiparty interactions in actor networks are typically the core of formal or informal participatory processes in resources management. One can distinguish two major aspects: (1) the processing of factual information about a problem and (2) solving management problems, i.e., problem/task management, and engagement in social exchange processes or social-relational issues. Social relations are inextricably linked to dealing with management problems because managers must explicitly take into account whose problems are solved and how these problems are framed. The integration of social and content issues is facilitated by relational practices such as task-oriented actions with

relational qualities of reciprocity and reflexivity (Bouwen and Tallieu 2004). Relational practices may take different forms, such as joint field visits or common training sessions. The quality of the interaction, the shared ownership of a task or project, openness for mutual testing and contradiction, and the opportunity for reflexive moments are all important components of such a practice.

Social involvement comprises essential elements of social processes related to problem definition, direction setting, and implementation, including issues such as the framing of the problem, the representation and management of boundaries, the type of ground rules and negotiation strategies chosen, and the role of leadership in the process. This concept has as its central hypothesis that content management and social involvement are strongly interdependent and cannot be separated.

Similar to the dual nature of the processes, the outcomes refer on the one hand to the implementation of measures to deal with an environmental problem but, on the other, to the capacity of the stakeholder group to deal with problems as well. It is assumed that high-quality processes in this type of multiparty cooperation lead to outcomes that are of a better technical quality, e. g., highly effective and beneficial to the environment, and enhance the relationships involved by, e.g., increasing the capacity of a stakeholder group to manage a problem and the satisfaction of the participants with the overall process. The contribution of the quality of the process to the outcomes is in line with the overall concept of procedural rationality, which states that the preference regarding an outcome of a decision depends on the nature and the quality of the process, or how the decision was derived (Joss and Brownlea 1999, Pahl-Wostl 2002*b*). Active involvement and the building of a sense of ownership of the overall decision-making process among all participants lead to a higher willingness to reach agreement and to more commitment to the outcome.

The overall social learning process can be described as a multiscale process. The foundation of social learning as investigated in the HarmoniCOP project are multiparty collaboration processes that are perceived to be the nuclei of learning processes. Such processes take place in networks or “communities of practice” (Wenger 1998) and are influenced by the governance structure in which they are embedded.

Hence social learning is assumed to occur at two, or even three, levels (Fig. 2):

- on short to medium time scales at the level of processes between collaborating stakeholders in collaboration processes (see below);
- on medium to long time scales at the level of change in actor networks (possible outcome/feedback of processes); and
- on long time scales at the level of change in governance structure (formal and informal institutions and cultural values, norms, and paradigms).

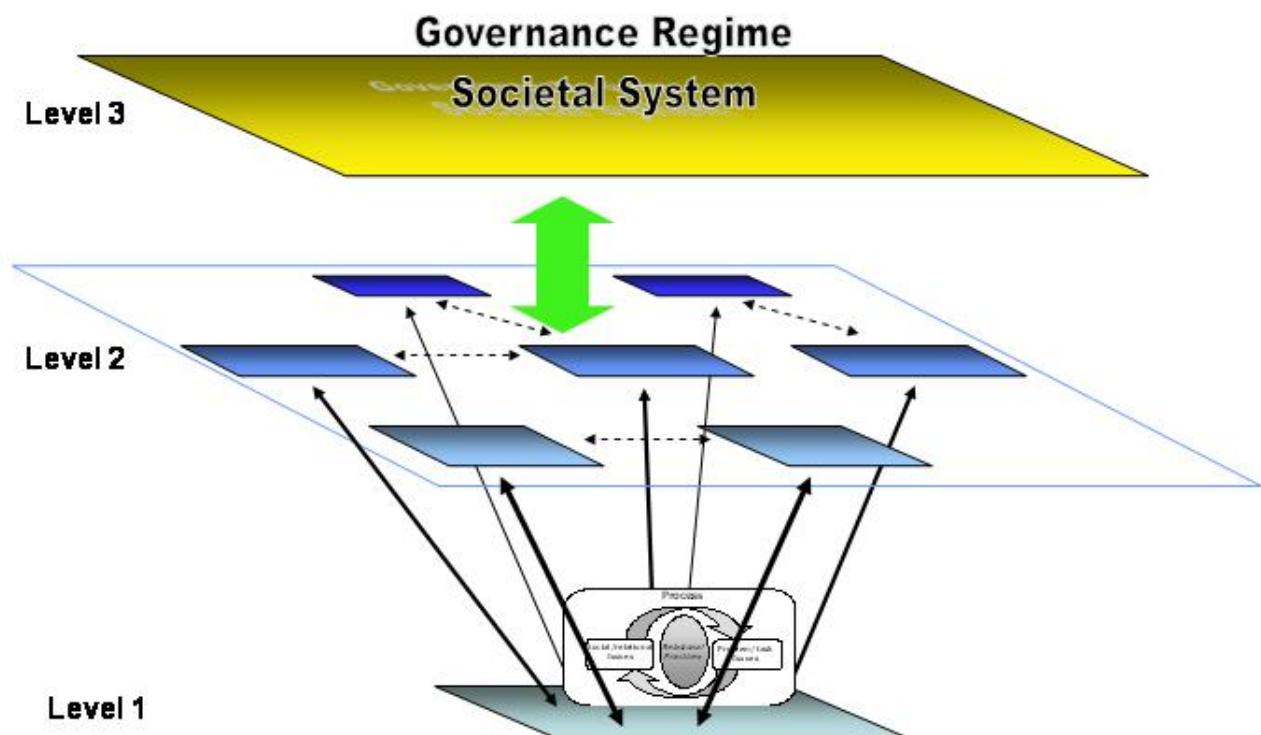
These three levels correspond to three different levels of agent interaction: micro, meso, and macro (see below). The three levels are interdependent, and multilevel change is assumed to proceed in an iterative and not necessarily sequential fashion via second-order feedback. An analogy may be drawn with the concept of single- and double-loop learning in organizational learning (Argyris and Schön 1978, 1996). Single-loop learning refers to an instrumental change in strategy within the constraints given by overall norms and beliefs. Double-loop learning refers to more radical changes in underlying values and beliefs.

It is assumed that long-term changes in governance structure and underlying values and paradigms cannot occur within a water management regime in isolation from the societal context. A comprehensive understanding of social learning must take these multilevel processes on different time scales into account. The next section explores in more detail the learning processes at Level 1, which were the main focus of the HarmoniCOP project, and the interactions of Levels 1 and 2. The subsequent section will analyze structural changes at Level 3 and its interactions with Level 2.

LEARNING IN MULTIPARTY PROCESSES

At the heart of the concept of social learning developed here are multiparty processes in which representatives from stakeholder groups interact on a regular base. Such processes may be more or less formalized. Olsson et al. (2006) and Gunderson (1999) emphasized the role of shadow networks as incubators for new approaches to governing social-ecological systems. They argue that the emergence

Fig. 2. Three-level representation of multiscale social learning processes: (1) Level 1 (micro): the multiparty collaboration process in which representatives from different stakeholder groups interact. As indicated, this level refers to the process level in the center of Fig. 1; (2) Level 2 (meso): the actors in the water management regime consisting of more or less organized stakeholder groups, e.g., authorities, associations, who may partly engage in bilateral interactions; and (3) Level 3 (macro): the governance and societal structural conditions that are characterized by cultural values, governance regime, or power structures. This level is identical to the conceptual framework illustrated in Fig. 1.



of shadow networks for adaptive governance is a self-organizing process often triggered by a social or ecological crisis. Nooteboom (2006) provided evidence for the importance of adaptive networks in sustainability transitions. Adaptive networks are self-organizing groups of policy makers who enable joint fact-finding and visualize how to achieve the desired improvements.

To improve our understanding of such processes, it is of interest to make use of the concept of "communities of practice" developed by Wenger (1998). Wenger originally developed his concepts for business environments, but, in recent years, these concepts have been used to analyze interorganizational collaborations and emerging social entities in general (Wenger 2000). Wenger

emphasizes learning as participation in groups of people who engage in a process of collective learning in a shared domain of human endeavor. Such participation is influenced by and may change the social structure. At the same time, the individual gains experience in the context of the group. Such learning processes confirm and shape the identity of the individual in his or her social surroundings. They confirm and change social practice and the associated interpretation of the environment. In communities of practice (CoPs), it is important for the collective endeavor to address a clear-cut issue. This condition seems to be met in most cases of multiparty collaborative processes in the context of environmental management. CoPs continuously redefine themselves by processes of participation, e.g., membership, acting, and reification, which includes forms, documents, and instruments. This is an important element in the formation of groups, i.e., membership must go beyond participation and be linked to joint practice. CoPs develop an identity of their own that is distinct from the individuals participating in them. In this sense, the participating actor groups can be understood as established CoPs, but a multiactor platform in itself can become a new or transitory CoP (see Appendix 1 for additional details).

CoPs can be understood as social forms to manage and generate knowledge. Because the results of social learning processes are preserved in a CoP in its shared roles and practices, they constitute social capital that goes beyond individual knowledge and skills. We use social capital here as defined by Putnam (1995, 2000) to refer to features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit. Thus, in economic terms, it can be argued that, the higher the social capital in a given social context, the lower the transaction costs needed in the provision of a public good such as environmental quality or improving ecosystem resilience. In terms of the analytical approach, CoPs can be understood as a new focus on diverse actor networks in the way they manage and generate knowledge. This is of particular interest in the adaptive management of complex river basins in which different sources of knowledge and a continuous process of learning from experience and new insights are, or rather should be, at the core of management practices.

Such a broad understanding of social learning that is rooted in the more interpretative strands of the

social sciences embraces different ways to understand knowledge. The natural sciences and engineering focus on knowledge as objective facts that refer to the purely cognitive elements of learning and largely neglect situated and experiential knowledge even when the latter is also of key importance in natural science and engineering practice. It is tacit knowledge that cannot be externalized but can contribute to innovation (Nonaka and Takeuchi 1995). Each individual develops his or her own tacit knowledge, which can only be shared by common practice. However, as pointed out by Hildreth and Kimble (2002), trying to make a clear distinction and create a dichotomy between tacit and explicit knowledge may not be useful, because knowledge always contains elements of both, albeit to a different degree depending on knowledge type and context. What has often been described as the “hard” and “soft” dichotomy is resolved if the dialectic and dual nature of knowledge is explicitly taken into account. All knowledge is enacted in skills and attitudes that result from shared experiences.

This leads as well to a different interpretation of the role of information and the ability of an actor network to use new information in social learning processes and derive collective action from new insights rooted in shared experiences. In particular, informal learning environments in which actors are more willing to leave entrenched positions are perceived to be crucial for the adaptive governance of social-ecological systems (Folke et al. 2005). Hence, an entirely new element of monitoring emphasizes the quality of the communication process in actor networks and the appropriateness of an implemented institutional setting for processing information and managing knowledge to achieve a certain task. Such understanding of knowledge has implications for the role of information and communication (IC) tools (Maurel et al. 2007), which range from simple graphical devices to GIS maps and integrated simulation models. It may also facilitate relational practices. Participatory modeling is an example in which models and the whole process of model development are embedded in a relational practice that links reflexive moments and different kinds of learning with model development and problem management (Pahl-Wostl 2002a, Pahl-Wostl and Hare 2004). Participatory modeling makes it possible to integrate both tacit and explicit knowledge and the combination of experiential and cognitive elements of learning. Consequently, the

role of IC tools lies in their potential to support social learning processes rather than just their ability to convey facts, elicit and formalize knowledge, and predict the consequences of human action.

Based on this understanding of Level 1 processes (cf. Fig. 2), it is possible to identify a suite of complementary processes that are of key importance in analyzing and understanding social learning. In the initial phase of any multiparty process, it is important to explicitly discuss and establish the ground rules for interaction. To increase the involvement and satisfaction of the participants, agreement on the ground rules, e.g., who sets the agenda, how conflicting views are managed, how decisions are made, etc., is an important element. The agreement on ground rules promotes joint ownership of a process and may reveal in an early stage potential sources of disagreement and conflict. Without explicit agreement on rules, no reflexivity or change of rules is possible (see *Interaction ground rules* in Appendix 2).

Despite the collaborative nature of social learning processes, strong leadership and facilitation have proven to play a key role (Tippett 2005, Mostert et al. 2007). However, leadership does not refer to imposing a view on a group but to collaborative leadership, which can mobilize energies, generate trust, give vision, and support the collective finding of a clear direction in a multiparty process (see *Leadership and facilitation* in Appendix 2).

In particular, during the initial stages of dealing with a problem situation, the processes involved in framing and reframing a problem domain strongly influence the direction of the overall process. Actors hold frames that determine how they give sense and meaning to information and their physical and social environments. Frames may derive from, e.g., culture, social role, scientific disciplines, etc. Differences in the framing of an issue are among the key reasons for miscommunication and conflict. The framing of an issue includes, for example, what is at stake and who should be included and in which role. As is also explained in *Framing and reframing the issues in the problem* in Appendix 2, processes of framing and reframing are essential elements of the social dynamics of the group during processes of negotiation of meaning.

The nature of the negotiation strategies chosen determines to a large extent the roles that different

actors are willing to take and the degree of openness of the process. Multiparty processes that are not too tightly coupled to a formal decision-making and implementation process leave more room for creativity and innovation because the participants may not start to negotiate from entrenched positions (see *Negotiation strategies* in Appendix 2). The role of leadership and facilitation is to generate the trust needed to engage in an open debate and leave entrenched positions.

Processes of social learning touch strongly on individual and collective identities and issues of ownership involving knowledge, processes, frames, etc. As a result, representation and boundary management between the in-group and the multiparty group is a crucial element. Most participants in multiparty processes act as representatives of their constituencies. At the same time, the overall group processes develop their own boundaries, which determine who is in and who is out and, related to that point, what is in and what is out, e.g., geographical scope, issues covered, etc. Consequently, as seen in *Representation and boundary management* in Appendix 2, a crucial element of social involvement is how the individuals and the group manage the various boundaries encountered in such processes.

All these processes act in concert and determine the dynamic nature and the quality of multiparty collaboration processes. Given their strong interdependence, it is impossible to isolate the influence of individual factors in empirical investigations.

The nature of these processes is strongly influenced by the governance structure and cultural context in which group processes are embedded. The ground rules chosen to govern interactions reflect the norms and experiences of the actors. Negotiation strategies are based on what is deemed to be acceptable and successful in a group. It was found in the case studies that rigid hierarchical and bureaucratic structures stabilized the status quo and provided strong barriers to social learning (Tippett 2005, Mostert et al. 2007).

What is learned in these social processes of multiparty interaction? Stakeholders define the goals and the means to achieve them. Within these groups, actors should learn to be able to deal with different perspectives and define collective strategies to solve a problem. It may be possible to

distinguish different layers of learning. Stakeholders may renegotiate strategies within prevailing paradigms and value structures; this is mainly learning at Level 1, within the multiparty process. However, multiparty processes may form the nuclei for changes in the context as indicated by the feedback loop in Fig. 1 and represented in the interaction between levels in Fig. 2. This may lead to changes in the social construction of the overall problem domain, in the value structures within organizations, and finally in a water management regime itself. Such change may also feed back to and be influenced by the societal context in which water management is embedded.

INSTITUTIONAL DYNAMICS AND CHANGE IN GOVERNANCE STRUCTURE

Figure 2 portrays schematically the structural governance context in which multiparty processes are embedded. The network of collective actors characterizing a water management regime (Level 2) constitute the direct level of interaction that is itself embedded in the overall governance structure, the societal context (Level 3). The perceived inability to tackle the challenges involved in current or future management problems may be a trigger for change in the overall water governance structure. However, a really fundamental change cannot be limited to water governance alone, because water management regimes are closely intertwined with the overall societal context. As defined by the Global Water Partnership dialogue on water governance (Global Water Partnership 2002), water governance refers to the range of political, social, economic, and administrative systems that are in place to regulate the development and management of water resources and the provision of water services at different levels of society. We adopt here this broad approach to governance, which encompasses all modes of political steering. Correspondingly, many linkages may be identified between Levels 2 and 3. Apart from formal connections, e.g. regulatory structures, informal influences such as the political culture of participation can be expected to have an effect on water governance. Indeed, empirical results from the HarmoniCOP (Harmonizing Collaborative Planning) studies revealed that the structural context had a significant influence on participatory processes (Mostert et al. 2007). We focus on two kinds of kinds of interaction:

- the role of social learning in informal actor platforms, which may act as a structural element to increase the adaptive capacity of water governance regimes, and
- the influence of the structural governance context on the implementation of such actor platforms, as well as the influence of the emergence of such informal structures on the governance context.

The informality of actor platforms implies that rules for membership or negotiation strategies are open rather than prescribed by formal institutions. Nevertheless, the lack of accountability and explicit rules resulting from excessive informality may also create situations of arbitrariness and make it hard to change tacit power relationships and regimes.

We use the word “institutions” to refer to the formal and informal rules governing the behavior of human beings. Formal institutions include laws and regulations such as the European Water Framework Directive, formal organizational structures, and formal procedures. Informal institutions can be defined as socially shared rules, usually unwritten, that are created, communicated, and enforced outside of officially sanctioned channels (Helmke and Levitsky 2004). They may refer to social norms or rules of good practice in a practitioner’s community. Formal and informal institutions may or may not be effective, and the processes by which compliance is achieved or even enforced differ largely.

For social learning to increase both the adaptive capacity and the effectiveness of water management requires a fine balance between the stabilizing and the change-supporting elements of a governance regime. Regulatory frameworks and cultural values provide long-term stability, whereas flexibility and change are provided by learning and negotiation processes in dynamic actor networks in which the interpretation of rules may be substantially renegotiated or rules may even be changed. A certain degree of stability is needed for actors to build their expectations regarding future developments that influence their own decision making. Processing information, negotiating, and changing rules are resource-intensive activities that should be limited to what is perceived by stakeholders themselves and by the policy analyst, respectively, to be necessary to cope with challenges arising for the management of water resources from a fast-

changing socioeconomic and environmental context.

Collaborative platforms may become de facto a permanent part of the governance structure, play a key role in cross-scale linkages at both geographic and organizational scales, and improve horizontal and vertical interplay in water governance regimes. This does not imply that such platforms have to or should be entirely formalized in terms of membership, procedural rules, roles, and the distribution of decision-making power. Formalization may destroy the very characteristics of the open platforms embedded in dynamic networks that render them so valuable in adaptive governance. Gray (1999) concluded from a comprehensive synthesis of empirical research on multiparty collaborations that the most resilient collaborative networks show a balance between increasing institutionalization and the formation of social capital, i.e., the increase in the ability of stakeholders to achieve collective learning and decision making, resolve conflicts, and build social trust. The formation of collaborative platforms can be depicted as a process of institutionalization. If structures and rules become rigid too quickly, the formation of social capital is impeded. However, in the absence of institutionalization, collaborative platforms are not sustainable because they are very vulnerable to changes in membership or leadership. One may argue that resilient networks should develop social capital among stakeholders while creating a modest level of institutionalization.

A salient benefit of collaborative platforms that can be characterized as communities of practice is their ability to bridge established boundaries in a dynamic and responsive way when implementing and sustaining integrated water management in general and the European Water Framework Directive (WFD) in particular. The HarmoniCOP project found that there was a need for bridging organizations capable of linking networks of action and translating the complexity of the changes occurring at the macro level as a result of the implementation of the WFD with the local communities and stakeholders acting at the micro level. In those governments, such as Germany's, that were able to anticipate the changes at the macro level and develop appropriate bridging organizations, the transposition of the WFD and the social learning processes associated with it was then carried out more easily. The implementation of integrated water management is not possible without the

increased collaboration of authorities and stakeholder groups from different sectors, e.g., spatial planning, flood protection, water supply management, that are not accustomed to interacting with each other in the fragmented institutional landscape characteristic of most water management regimes (Mostert et al. 2006). The choice of a biophysical reference such as the river basin to determine the spatial scale leads to spatial misfits between biophysical and administrative boundaries. By bridging boundaries among authorities operating at different scales, constituencies, expert groups, and communities of practice may indeed increase collective capabilities and social trust. The institutional context of largely informal networks maintains the flexibility needed to respond to emerging challenges. Formal institutions are often too rigid and inflexible to be able to respond.

An explicit role of the collaborative platforms embedded in formal regulatory structures is to make the dynamic relationship between formal and informal institutions more transparent and functional. These platforms provide a social context for exploring and changing the relationship and for resolving possible conflicts among the social norms and rules enacted in practice, the values and interests of different groups, and the formal rules prescribed by legal frameworks. Powerful groups always find a way to make sure that their interests are heard. Collaborative platforms should guarantee open access to participation and information. An obvious consequence of the establishment of such platforms is a change in power relationships. The overall process is strongly determined by the political culture characterizing water governance, which is strongly influenced by the political system and culture in which it is embedded.

The water governance regime may change when new kinds of networks emerge and the stakeholders participating in them gain new experiences and share them with their constituencies. This suggests that institutional change derives mainly from alternative practice rather than from deliberate consideration and choice between alternative governance structures and the implementation of new formal rules (see also Lindner 2003 for a similar argument). It is highly unlikely that water governance will change in isolation from the formal institutional rules and cultural norms that characterize the prevalent political and societal environment. A range of national analyses performed in the countries of the HarmoniCOP case

studies has provided evidence for the strong influence of national cultures, e.g., degree of centralization or individualism, on conditions for participatory and social learning processes (see Patel and Stel 2004). Hence, even more long-term developments may result in structural changes in a recursive and iterative process between the second and third levels depicted in Fig. 2. Changes at the level of the social system as a whole may trigger and/or support change in water governance, which then may support the stabilization of innovation at the societal level. The increase in the awareness of complexity and of the need to develop dynamic and innovative management approaches is, for example, a widespread phenomenon in business and politics, and water management is rather slow to address this issue (Pahl-Wostl 2007a).

CONCLUSIONS

This paper argues that processes of social learning and the presence of informal actor platforms are of major importance when it comes to implementing and supporting integrated and socially, environmentally, and economically sustainable resource management regimes over extended periods of time. However, it is of crucial importance to better understand the role of bridging organizations and the interplay between formal and informal institutions.

We would like to highlight here three important implications for water governance and water management:

1. The principle of integrated water resources management has been criticized for being unrealistic. For example, Biswas (2004) and several of those who responded to his article pointed out a number of barriers to implementation. The integration of sectors and issues would require more centralized policy development and implementation and thus larger, slower, and more bureaucratic authorities to handle all policy aspects. Furthermore, objectives such as stakeholder participation and decentralization would be unlikely to promote integration. However, this paper portrays another perspective, i.e., that of a more dynamic actor landscape in which integration is not achieved by bureaucratic hierarchies but rather by processes of network governance. It also highlights the need and the requirements for

processes of social learning to build the capacity to achieve joint solutions and to make thus stakeholder participation effective in terms of achieving the goals of water management.

2. Water management is facing increasing uncertainties because of climate change, fast-changing socioeconomic boundary conditions, and the goal of integration over a wider range of objectives. As a consequence, effective water governance must be adaptive. This paper highlights structural elements and processes in water governance regimes that make them more adaptive without compromising their stability.
3. In most countries, the structural conditions for integrated and adaptive water management have not yet been determined. Consequently, there is a need for major changes in which the kinds of processes highlighted in this paper will most likely play a major role.

Challenges still lie ahead, in particular, in collecting additional empirical evidence and in using available empirical studies for comparative analyses. Our analysis suggests that the development of such adaptive institutional settings involves continued processes of social learning in which stakeholders at different scales are connected in flexible networks and sufficient social capital and trust is developed to collaborate in a wide range of formal and informal relationships ranging from formal legal structures and contracts to informal voluntary agreements. The multiscale nature of institutional change is a quite fascinating and highly relevant area of research of which this paper could tackle only a few aspects.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/vol12/iss2/art5/responses/>

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APPENDIX 1. COMMUNITIES OF PRACTICE

Wenger (1998) introduced the idea of “communities of practice” (CoPs) as an analytical concept intended to help elucidate the links between knowledge, learning, and communities within organizations. CoPs are groups of people who interact and perform common tasks, e.g., an interorganizational working group. CoPs are created by the members participating in them, who develop a shared repertoire of resources. Wenger conceives of learning as social participation or “the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises” (Wenger 1998:55-56). Participation can take different forms: “conflictual as well as harmonious, intimate as well as political, competitive as well as cooperative” (Wenger 1998:55-56).

Participation alone remains too open without the other constituent process that transfers the negotiation of meaning into something tangible: reification or giving concrete form to something abstract. Wenger uses this concept to refer to “the process of giving form to our experience by producing objects that congeal this experience into ‘thingness’” (Wenger 1998:58-59), through making, designing, or representing things. Wenger points out that, although participation and reification are analytically separable, in reality they are a single duality, and one cannot replace the other. Participation is indeterminate without reification, and reifications become meaningless without participation. In terms of the social learning concept developed in the HarmoniCOP project, social involvement and content management can be distinguished analytically but do not exist independently in a real social system.

APPENDIX 2. KEY PROCESSES IN SOCIAL LEARNING

Interaction ground rules

Ground rules refer to the norms and criteria that the members of a multiactor group use to deal with each other and with the issues. Setting jointly developed ground rules at the onset can help to overcome feelings of uncertainty about how to proceed in the multiactor environment (Vansina and Taillieu 1997). Ground rules also refer to the formal and informal regulations and work forms that organize a concrete interaction between the actors of a group with regard to aspects such as:

- who to invite and how to invite them;
- how to set the agenda;
- who should deal with specific issues individually, bilaterally, or multilaterally;
- how to treat information, e.g., as confidential, for internal or external use, as suitable for the general public, etc.;
- how to deal with different points of view and interests; and
- how to make decisions, e.g., majority, unanimity, veto.

Minimal agreements on ground rules can enhance the active involvement of the total actor group. Early agreements can facilitate the startup of activities, but ground rules can also evolve over time as the result of a learning process. Actors with similar cultural, social, or organizational backgrounds may have a lot of ground rules in common. These can be adopted implicitly by the multiactor group. However, when actors with different backgrounds are involved, the ground rules will need to be stated and negotiated explicitly.

Leadership and facilitation

The multiactor domain needs some form of direction setting to facilitate joint responsibility for developing solutions. Because of the ambiguity of the issues in the problem domain, asymmetries among the actors in power, resources, and/or expertise, and the complexity of the situation, participants in multiactor contexts may experience a strong need for leadership that can take away the uncertainties and ambiguities. However, classical leadership models are not suitable for multiactor settings, because they assume the existence of a formal leader with managerial responsibility and clear and accepted goals, whereas in multiactor settings no single organization has hierarchical control over all the others and agreeing upon collaborative goals is an important challenge (Huxham and Vangen 2000b).

The literature on multiactor processes stresses the importance of shared or distributed leadership in participative systems as an ideal (Brown and Hosking 1986, Gray 1989, Bryson and Crosby 1992, Chrislip and Larson 1994, Feyerherm 1994, Yukl 1999, Gronn 2002). They stress that inducing shared responsibility is a critical function of leadership. It is neither desirable nor likely that a single individual take up all the leading roles. However, strong leadership may be important at certain points to “manage the process leading to collaboration, particularly at points of pivotal breakdowns.” (McCaffrey et al. 1995:618). When this leadership focuses exclusively on the task, e.g., gathering information, working out plans, managing the budget, etc., there is a risk that the results will be suboptimal, because in such cases a strong leader may provoke high dependence in some actors and/or resistance from actors who feel excluded or put at a disadvantage. In fact, strong process leadership may be critical for multiactor collaboration (Chrislip and Larson 1994). Process leadership is about creating the conditions needed to get the most out of the diversity of perspectives, competencies, and resources, while ensuring that each

actor can meet his own objectives (Vansina 1999). Managing the inherent tensions in the relationships among actors in interdependent work is an important aspect of process leadership. This kind of leadership can be understood as “convening” the actors and keeping the collaboration going, rather than steering and controlling the process unilaterally.

In some cases, especially when there is conflict, a third party such as a facilitator or mediator is invited in to take up process leadership (Schuman 1996). Facilitators, either explicitly designated or implicitly functioning as such, can fulfil an important role in dealing with the inherent tensions in multiactor domains (L. Vansina, *unpublished manuscript*). However, facilitation should be used in a very cautious and flexible way, and it certainly takes more than mechanically following some participatory recipes (Leeuwis 2000). Those who take up facilitation roles need to be serious “reflective practitioners” (Argyris and Schön 1974, Huxham 2000a), who can apply the toolbox of participatory methods (Jones 2001) from a good understanding of process.

Framing and reframing the issues in the problem domain

A problem domain such as the management of a river basin is not just out there in the natural world, it is imbued with meanings by social actors who call for an intervention in a situation that they perceive as a threat or an opportunity. Actors define or “frame” a domain as problematic and requiring intervention through selectively identifying the main issues and delimiting its boundaries. They gradually “cut out” a part of the ongoing reality, in interaction with the other social actors, and attribute a problematic character to it. This we call the interactive framing of issues in the problem domain (Lewicki et al. 2003, Dewulf et al. 2005).

Different social actors tend to acknowledge and highlight different aspects of reality as problematic, because of their specific practices and experiences and the specific frames they tend to use for making sense of them. When actors look at a situation from a different point of view, a situation ensues in which different perspectives or frames are at play simultaneously (Salipante and Bouwen 1985, Bouwen et al. 1999). In addition to identifying the different frames used by the actors involved to make sense of the problem domain, it is also important to look at how those frames develop, evolve, and influence each other when actors interact in the course of a planning or management process. Although each actor typically starts with a specific framing of the problem, this definition shifts through the interactive process of shaping issues. Frames are co-constructed through the way actors make sense of their situation in interaction with others (Putnam and Holmer 1992). The nature, importance, scope, interrelatedness, breadth, and stability of problems are negotiated through the arguments and counterarguments of the actors. Dealing with these differences in framing between actors is an inevitable and crucial aspect of river basin management. When differences can be dealt with constructively by addressing them and trying to connect them instead of avoiding or escalating them, new possibilities can be discovered and social learning becomes possible.

Negotiation strategies

Both dialogic exchange and strategic behavior are likely to be present at the same time in multiactor negotiations. Co-management of water resources then becomes a continuous process of dialogue and negotiation in which actors defend their own interests and at the same time construct a broader and common problem domain.

In the negotiation literature, a distinction is made between distributive and integrative negotiation strategies (Fisher and Ury 1981, Bazerman 2000). This distinction is often explained by referring to the pie metaphor: Distribution is about cutting an existing pie in smaller or bigger pieces, whereas integration is trying to increase the size of the pie, to better serve the interests of all the actors. Defending predefined positions on the issue can paralyze a negotiation, whereas exploring underlying interests provides a better chance of finding innovative and mutually beneficial agreements.

Direct interactions among representatives play an important role in transforming competitive, i.e., distributive or win/lose, relationships in collaborative, i.e., integrative or win/win, relationships among the actors. These kinds of micro-social interactions among the representatives are a necessary although not sufficient condition for social learning to develop. Representatives need to be capable of justifying and feeding back their personal learning to their constituencies. Research evidence suggests that representatives of diverse actors can construct a common vision through direct multilateral discussions. However it seems harder to cope with the differences when it comes to planning concrete actions, and so this part tends to be left to bilateral negotiations (Vansina and Taillieu 1997).

Representation and boundary management

Although multiactor processes involve organizations and social groups, much of the information exchange, sense making, decision making, negotiation, and learning takes place among individual representatives. Their mandate and their position in their own organization can differ widely, and so does their degree of freedom to make decisions without consulting their constituency. Some representatives may represent an underorganized actor group or an internally divided constituency, which can lead to insecure or inconsistent behavior.

One of the major tasks of representatives is to manage the boundaries between their own organization and the multiactor context, because the traditional boundaries of hierarchy, structure, role, and task are often not available. Therefore, the actors have to manage and negotiate so-called “psychological” boundaries on a continuous basis (Hirschhorn 1990). These include the boundaries of identity, task, and authority. These boundaries are subject to changes and negotiation during the collaborative process. If the boundaries around the multiactor group are firm enough, this enables the representatives to develop a collective identity based on common interests (Vansina 1999). However, if identification with the multiactor group is too strong, this might lead to conflicts of loyalty with one’s own constituency. This may result in a dual conflict in which the representative who comes back from difficult negotiations with the other actors faces an equally difficult negotiation with his or her constituency about the agreement that was reached.

The so-called “dilemmas of the negotiator” refer to the growing tension that representatives may experience at the boundary between the expectations of their constituencies and those of the multiactor group. Representatives are supposed to identify with their constituencies and express their perspective and interests. However, in the course of a collaborative process, they may gradually learn to appreciate a situation from the perspectives of the other actors and to develop alternative problem definition and solutions, so that they come to identify more with the multiactor group. The dilemma of transformation refers to the fact that, the more the representative tries to transform the positions of his constituency, the greater the chance to come to an agreement that is satisfactory for all actors involved. However, the same efforts to transform these positions may pose a risk for the representative when the constituency starts to question his or her legitimacy.
