Network Governance, Institutional Learning and Environmental Effectiveness

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I. Introduction

In the face of apparent failures to govern complex environmental problems by the central state, top-down policy-making and new modes of governance have been proposed in recent years. *Network governance* is an emerging concept that has not yet been consolidated. With its roots mainly in the economic (Jones et al. 1997) and policy networks literature (Kenis and Schneider 1991; Scharpf 1997; O'Toole Jr. et al. 1999; Haas 2004), network governance is increasingly being proposed to cope with sustainability problems. Assuming given sustainability goals, (policy) networks are expected to be created, encouraged or maintained by a central steering actor (such as the state), which either directly takes part in a network or supervises/steers it from outside (Dedeurwaerdere 2005).

Three different lines of reasoning as to why and how this approach helps improve environmental governance can be identified. From an (economic) transaction cost approach, networks are viewed as an intermediate form of governance between hierarchies and markets, allowing actors to react flexibly to complex, uncertain and changing environmental conditions (compared to hierarchies) while being more stable and reliable than pure markets. Second, the creation of networks allows the different sources of knowledge and competences provided by the different actors to be integrated, especially when the network structure fosters efficient information sharing and social learning (Cross et al. 2004). Third, from a more abstract perspective of complexity theory, networks as “dissipative structures” between markets and hierarchies “at the edge of chaos” are expected to produce emergent and more creative solutions compared with other forms of governance (Kappelhoff 2000).

However, if network governance is considered to do more than merely involve the relevant stakeholders and interest groups in decision-making, then processes of institutional (or social, collective) learning become an essential feature (Knoepfel and Kissling-Näf 1998; Siebenhüner and Suplie 2005). Institutional learning not only refers to cognitive changes in individuals within a network, serving as a structural framework, but is moreover understood as a process in which individual changes in cognition lead to modifications in collective rules/institutions, either by consensus or by some other mode of aggregation. The key issue this paper seeks to approach is the mutual relation between network structures, institutional learning and effective policy outputs. While on the one hand an established methodology of social network analysis (SNA) techniques is available and, on the other, there is a growing body of research on institutional (collective, social) learning, there have been few attempts to apply SNA techniques to collective learning and governance issues (Kenis and Raab 2003).

This contribution is organised as follows. Given the ambiguities of the concepts at stake, we begin in section II by explicating our understanding of both networks and institutional learning. Subsequently, in section III we address the three main research questions: (1) What are the characteristics of a network that foster institutional learning for sustainable development? (2) How does institutional learning alter network structures? (3) How do network governance and institutional learning help to formulate and implement policies in the context of environmental change? We conclude (section IV) by outlining a number of open issues for further research.

II. Fundamental concepts

1. Social Networks and Network Analysis

In the sense of social science, networks are defined as a group of actors connected to each other by interdependent social relations (Schweitzer 1988). Within these groups, mutual formal and/or informal norms and values exceed those necessary for market transaction, but they do not accomplish the hierarchical top-down, command and control structure. It is possible to distinguish between three different functions that networks structures need to provide in order to enable effective institutional learning for governance purposes:

- *Information transmission:* Through the interaction and communication of actors, knowledge and information can be transmitted among the actors (information distribution or diffusion). This is a first prerequisite of the collective learning of actor groups. Actors will archive access to relevant information and will gain from such information with relatively low effort. Furthermore, actors' different competencies and knowledge resources can be combined to advance the competencies of the entire network. However, the function of information distribution is not self-fulfilling, but requires a certain network structure and quality of the relations.
- *Deliberation:* By incorporating not only knowledge but also norms, values and perspectives of different actors into a decision process, networks provide an ideal breed-

ing ground for deliberation, discourse and exchange of arguments. This is expected to lead to solutions that are both more creative ("emergent") and more widely accepted.

- *Resilience:* Networks must furthermore exhibit certain resilience to abrupt change, such as the sudden exit of a key network actor who has either strong resources or an extremely high centrality in a highly centralised network. A certain redundancy of both competencies and network relations thus makes the network less vulnerable and therefore potentially more effective with regard to governance tasks.

Networks are not spatially or institutionally restricted to organisational boundaries. They are made up of the interactions of their members within a common problem framework. These interactions may found in a common interest in the problem or in cognitive commodities in acting and problem-solving. However, networks also build up structures of regulatory frameworks and norms for interaction and the decision-making process, which constitute the institutional factors of networks. These structures are not as strong as in organisations and under hierarchy but are tighter than in pure market circumstances. The common focal point is the congruent problem and reality perception that forms "epistemic communities" (Haas, 1992:3).

Although participation in these epistemic communities require an interest in the problem at stake, the actors involved do not necessarily share the same interest. In general, their interests are interdependent but can also be different or sometimes contesting. This leads to the need for negotiation, consensus-building and the development of cognitive commodities.

This highlights the important role of the quality of the relations in the network to enable it to fulfil these three functions. Granovetter 1982 distinguishes between strong and weak ties to characterise the intensity and quality of the linkage between actors. Strong ties are characterised by solidarity and trust between two actors. They are the basis of societal influence and social capital in networks. However, an actor's number of strong ties is limited since the implementation and maintenance of this kind of relation is time-consuming and requires a lot of attention. In contrast, weak ties are less redundant and more flexible than strong ties. Hence, they can bridge longer distances within a network, thus providing new information and knowledge for the network. Moreover, weak ties can link the members with other actors of a policy arena outside the boundaries of the network. However, due to the loose but flexible linkage between the actors, weak ties are not suitable for creating trust, shared values and norms.

Insofar as network structures are mainly based on the bilateral trust of actors to respect the mutual normative frameworks, they enable an environment of problem-oriented interaction and decrease the actors' transaction costs. This leads to stable relations, facilitating the development of collective action (Ostrom 1990) routines. On the other hand, the trust between actors also emerges with the danger of a closed common "world view" of the actors. In the long run, therefore, networks tend to stabilise linkages, decision and action routines and attitudes. This endangers two effects. First, the long-term stable relations between actors without "fresh" perspectives from outside can lead to the inflexibility of the network and "cognitive blocking" (Messner 1995), disabling the network to react adaptively and innovatively to new challenges. This leads to an attitude of non-learning. Second, on the basis of their long-term,

trustful and stable relations, actors develop the tendency to include social enclosure and path dependencies in their actions. This group thinking (Janis 1982) builds a stable paradigm that only allows incremental changes in values, beliefs and action within the specific framework of reality perception. Paradigm shifts (radical changes) can hardly be implemented in these networks.

However, a multi-centric structure of networks with transparent borders (weak ties) in combination with stable social capital (strong ties) within the network enables the same to increase its adaptive capacity and can lead to flexible, problem-oriented and effective decisions and actions.

The advantages of networks as deliberative structures at the so-called “meso-level” between the market and hierarchy, which incorporates different knowledge sources and competencies, led to an uptake of networks as a governance approach in the late 1990s (for an overview see, for example: Diani and McAdam 2003; Haas 2004; Ostrom 2001; Reinicke and Denkg 2000. By incorporating actors from different sectors, the approach aims to provide an innovative environment of learning, paving the way for adaptive and effective governance (Dedeurwaerdere 2005). Since networks use a “paradigmatic governance” approach (Fürst 2002) based on a shared normative framework of values and rules, they can help institutions to work more smoothly and adaptively in a dynamic environment. The mutual paradigm of the network allows them to act collaboratively without permanent negotiating action rules and norms. However, the danger of the failure of these structures is also incorporated in the network approach itself. According to Messner 1995, network governance approaches will fail under the following conditions:

- The actors do not develop a common problem-solving orientation but only follow their own lobby orientation (Olson phenomena)
- Previous experiences with the mechanism of collective consensus-building and conflict resolution network structures are lacking. This can lead to endless disagreements
- The development of “generalized trust” between actors as a major precondition for network success fails because of a lack of institutions

These points underpin yet again the relevance of the properties of the network with regard to the successful appliance of the network approach. Tichy et al. (1979) distinguish between three sets of network properties:

- transactional content (exchange of effect, influence and power, information, goods and services)
- nature of the links (intensity, reciprocity, clarity of expectations, multiplexity)
- structural characteristics

While the transaction content and nature of links focus on linkages between pairs of actors, the structural characteristics describe the network as the whole. Social science research has developed a wide range of instruments to describe and evaluate network characteristics. To analyse networks in a standardised and formalised manner, the methodology of network

analysis (Scott 2003; Tichy et al. 1979; Wasserman and Faust 1999) has meanwhile become rather advanced and elaborate. The network analysis interprets structures as important social characteristics. The aim of the method is to use the structural characteristic as an explanation of individual behaviour or to explain the change of structures by the behaviour of the individual. This relation between individuals, behaviour, structures and institutions is the main objective of the network analysis. Hence, this methodology provides a comprehensive and powerful toolbox to evaluate social network structures.

2. Institutional learning

Institutional learning aims at groups of actors managing complex common pool problems together and finding integrated solutions to these problems. In this sense, one can define the group of actors as the network, and institutional learning as the process in which actors with a network can interact. However, the relation between networks and institutional learning is often unclear and not considered conceptually. Following Schusler et al. 2003, we think of institutional (collective, social) learning as "learning that occurs when people engage one another, sharing diverse perspectives and experiences to develop a common framework of understanding and basis for joint action" (p. 31).

In contrast to individual learning, institutional learning not only refers to cognitive and behavioural changes in individuals within a network, serving as a structural framework, but is also moreover understood as a process in which individual changes in cognition and action lead to modifications in collective rules/institutions. Institutional learning is strongly related to the concept of social learning (Hall 1993), which sees the sources of a decision-making process not only in power and interests, but also in a growing capacity of social entities to perform collectively on common tasks on mutual norms in a context of uncertainty and common puzzling. Social learning implies "learning about the dynamics of change of the human system and the ecosystem, about the mental frames that shape decision making, and the biophysical and social consequences of change" (Pahl-Wostl 2002: 401). To respond to the expectations and challenges formulated from different perspectives, social learning must be conceived as more than just cognitive learning. "Learning together to manage together" also involves changes in attitudes, beliefs, skills, capacities, and actions in and among the counterparts (Craps 2003).

This transfers the term learning to a more abstract level, which concerns the underlying values, beliefs and attitudes of the actors (group). Hence, it is necessary to disaggregate learning and conceptually distinguish between different forms of learning. Argyris (1982) developed the concept of single loop and double loop learning, which is valuable in this sense. The concept argues that single loop-learning occurs when an experience has led to the detection of a mismatch, which is corrected without changing the underlying values, but remains within the accepted routines. In double-loop learning, however, the detected mismatch leads to a change of the underlying paradigm (Argyris 1982). The change in the paradigm requires as well new rules of conduct and routines (Argyris 2003).

This concept can be aggregated to networks and social learning. An actor group reflects on the experiences of collective action and adapts the way how to reach a goal (single-loop learning). Double loop learning implies a reflection on the goals themselves and on the interrelations between the network members (Maurel 2003). Then, learning also affects the common rules and institutions of the network, which represents institutional learning.

A second conceptual differentiation is needed regarding the subject of learning (who learns and how) and the learning object (what is learned and why). Regarding the subject of learning, it has to be stated that only an individual can learn in the sense of changing behaviour and actions. A group or a network as such cannot learn, but is always dependent on the learning of its members. However, an individual is embedded in a group or network and will influence and be influenced by other social actors, their learning and actions. Hence, there is a relation between individual learning and the collective learning of a network (Crozier and Friedberg 1979)

Depending on the level of learning (single- or double-loop), networks can support or impede learning efforts. In particular, in long-term stable network relations (strong-ties), double-loop learning is difficult to achieve since the effect of social closure and group thinking will hinder actors to reflect about goals, norms and rules. Double-loop learning processes, i.e. shifts in the paradigm, will mainly occur in the (re-)formation phase of a network (Döhler, 1993). Whereas single-loop learning is generally supported by network structures, information flow and the adaptation of the same are supported by mutual trust and the common normative framework. Nonetheless, first- and second-order learning also have the effect of structural change on the network relations over time.

The potential effects of the network structure on the feasibility of institutional learning and on learning in the network structures will be analysed in the next chapter.

III. Mechanisms

This chapter will conceptually analyse how the procedural character of learning and the structural character of networks influence each other. Although it is common sense that learning processes and network structures are interdependent, little research has been done to make these interdependencies explicit.

Although social network analysis provides powerful tools to analyse and compare different network structures according to formal criteria, until now this area of research seems largely unconnected to the literature on network governance and social learning (Kenis and Raab 2003).

To provide a step in filling this gap, we endeavour to use the methodology of social network analysis to identify typical structural characteristics of a network fostering individual, collective and, finally, institutional learning. Furthermore, by identifying these networks characteristics linked with learning it would be possible to describe structural changes of network due to learning and, finally, to explore how network governance and institutional learning can help to implement environmental policies.

1. Network characteristics fostering institutional learning

Institutional learning within networks happens as a collective learning process of the participating actors changing mutual norms and institutions.

As networks as such cannot learn, but only their participating individuals, the point of departure for an analysis of the supporting and impeding characteristics of a network for learning has to be the network features supporting individuals' learning. Still, the characteristics of the network supporting or impeding a change of common rules and institutions (paradigm change) are relevant, in particular for institutional learning. With respect to interesting institutional learning, the two-level learning approach by Argyris (1982, 2003) might provide a good framework to systematically analyse the necessary network characteristic for single-loop and double-loop learning.

Social network analysis provides analytical tools for both the individual network of an actor (ego-networks) and the entire network structure. To analyse the supporting and impeding factors for learning, this investigation focuses on the characteristics of the entire network. This includes quantitative measures as well as qualitative characteristics such as the interaction content and the nature of the network relations.

The following qualitative and quantitative charateristics of networks seem to be most relevant to learning: the nature of the linkage, the interaction content and frequency, the network size, density, cohesion and centralisation, the homophily of the actors, the multiplexity of the relations, and the relation of strong ties to weak ties. These characteristics can be adverted to the three functions of social networks (information distribution, deliberation, resilience) and to the levels of learning. Thus, this leads to a matrix representing the supporting / impeding factors of the different network characteristics for single- and double-loop learning and the three functions which networks provide (table 1). All these features and variables will be described in the following.

Network function / Network characteristic	Information transmission	Deliberation	Resilience	Single-loop learning	Double-loop learning
Network Size	–	medium: +	+	medium: +	–
Density	++	+	+	+	–
Cohesion	+	++	+	+	–
Centralisation	+	–	–	+	+
Homophily	+	+	+	+	○
Relation of weak to strong ties	+	–	○	○	+
Network multiplexity	+	+	+	+	–

Table 1: Hypothesised influence of different structural network measures on the performance of different network functions. '+': high (low) values in the independent variable lead to high (low) values in the dependent variable; '–': vice versa; '○': no discernible or unclear influence.

According to Tichy et al. (1979), relations between actors can be based on the exchange of effects, information, influence and power, or goods and services. In general, all content features can support the single-loop learning of actors, as they all provide experiences that can be reflected, leading to a change in behaviour. However, information and influence relations are more eligible for learning than relations of the exchange of goods and services. Nevertheless, both information exchange and influence exchange are needed to foster learning within a network. If only information exchange is established, there can be no certainty that the information provided by one actor is adopted by another. Hence, the first actor needs to influence the second to convince him/her.

The transactional content features of the linkages between actors can be characterised by the terms intensity (strengths of a relation between individuals, i.e. strong and weak ties), reciprocity (degree to which a relation is perceived and agreed on by both parties of the relation), clarity of expectations (degree to which the pair of individuals has clearly defined expectations about each other) and multiplexity (degree to which pairs of individuals are linked by multiple relation contents). To support learning, relations in a network should be characterised by a high degree of intensity, reciprocity and multiplexity. These three characteristics are the basis of trust among the actors, which is needed to develop a learning-supported environment. However, high values in these characteristics can also indicate a cognitive blocking situation that does not allow double-loop learning and hence radical changes and a paradigm shift.

In contrast, a high degree of interaction frequency is supposed to be beneficial for both single- and double-loop learning. Interaction frequency, however, has to be distinguished from relation intensity (Marsden 1990). The frequency of interaction can support the intensity of the relation. This, however, does not necessarily lead to the better quality of the relation (higher intensity). However, actors with a high frequency of interactions with a greater number of other actors in the network can be valuable for including in information sharing and dissemination (Hubacek et al. 2006) but also for initiating and fostering a shift in institutional settings. This also means an actor's high degree of centrality, i.e. the degree to which how centrally a specific actor is positioned in the network is valuable for collective and institutional learning in networks. A central actor can bridge the network across boundaries and distribute the information to a high number of network members. Hence, it is moreover valuable for learning within a network if these central actors are linked to the surrounding policy area via boundary-spanning relations (Liebeskind et al. 1996). The characteristic 'openness', defined as the number of actual external links of a social unit in relation to the number of possible external links (Tichy et al. 1979), illustrates this.

In principle, human communication theory states that the distribution of knowledge and flows of ideas mostly occur between individuals who are similar, or homophilous (Rogers 1995:18). Homophily is the degree to which two actors in a network interacting with each other have certain similar attributes. For information flows leading to single-loop learning, this is an advantage. A network with a high degree of homophily is supposed to distribute information and knowledge more quickly, i.e. the actors have a better source to learn. Again, for a paradigm shift to double-loop learning this is not that clear. Effective information and knowledge

distribution is needed here, too. Nevertheless, homophilous actors also tend to close their perceptions to outside information.

An important factor regarding whether learning would be supported by network structures is the network size. Presuming that strong ties are very important for effective information distribution and learning within a network and, furthermore, that the number of an actor's strong ties is limited, the number of actors within a network is limited, too. However, there is also a minimum of actors needed to guarantee a fruitful and innovative exchange of knowledge, ideas and perspectives. Experiences from case studies demonstrate that the ideal network size for fostering learning is about 8-15 actors (HarmoniCOP 2003). Large networks should be divided into sub-networks linked by key actors, forming a meta-network. This can be analysed by the degree of clustering, i.e. the number of dense regions in a network (Webler et al. 1995). Larger networks are also likely to exhibit stronger resilience to change as, e.g. the exit of actors or the termination of relations can more easily be replaced by others in the network.

Second, both network density and cohesion are likely to foster almost all network functions, information transmission in particular (Valente 2005). The denser a network, i.e. the more relations exist in a given network, the more easily information will be transmitted. Deliberation, on the other hand, is particularly supported by high cohesion, i.e. a high number of reciprocal relations, allowing for interactive discussion, which is virtually impossible in one-way relations.

A third important factor of the network structure is the network centralisation and opinion leadership in the network. Regarding consensus on values and goals, more centralised networks combined with a high option leadership of the central actor are regarded as more suitable. Likewise, Communities of Practice are expected to show high network centralization or "coreness" (Cross et al. 2004; Everett and Borgatti 2005). However, overly centralized networks are also seen as vulnerable because of their strong reliance on a few heavily linked individuals. Experiences from various case studies show that networks and hence learning processes will collapse if an actor with high option leadership leaves the process (Nicolini and Ocenasek 1998).

2. How institutional learning changes network structures

Network structure and the quality of relations may not only be conceived as independent variables with respect to institutional learning (see above), but also as dependent variables. The question is then how processes of learning change the network structure and the qualities of relations among actors (Knoepfel and Kissling-Näf 1998). While learning is expected to change the knowledge network, this in turn may change the communication network and ultimately change formal roles and collective institutions (see figure 1). To analyse how learning changes network structures, it is important to consider the different subjects of learning (individual and collective) and the three learning levels proposed by Hall (1993).

First- and second-order learning is understood as the simple adaptation of actions to a new experience. This is mostly done by individuals or collectively, but based on individual learn-

ing. Changes of the network structure mainly affect those of the communication and knowledge transfer among the network members. First- and second-order learning can lead to more intense exchange between actors and hence to increased network density. In addition, the intensity and reciprocity of relations can slightly increase, as well as interactivity within the network.

Changing communication and knowledge transfer structures can also change the roles and tasks of actors within the network. This can also lead to an increase in the degree of centrality for one or more actors and a decrease for others. A change in the centrality of an actor can also affect his/her opinion leadership, in particular if centrality decreases. Regarding the whole network, collective learning processes – such as learning about the competencies of other actors in the network – may lead to higher network centralisation, reflecting a specialised and more efficient communication structure

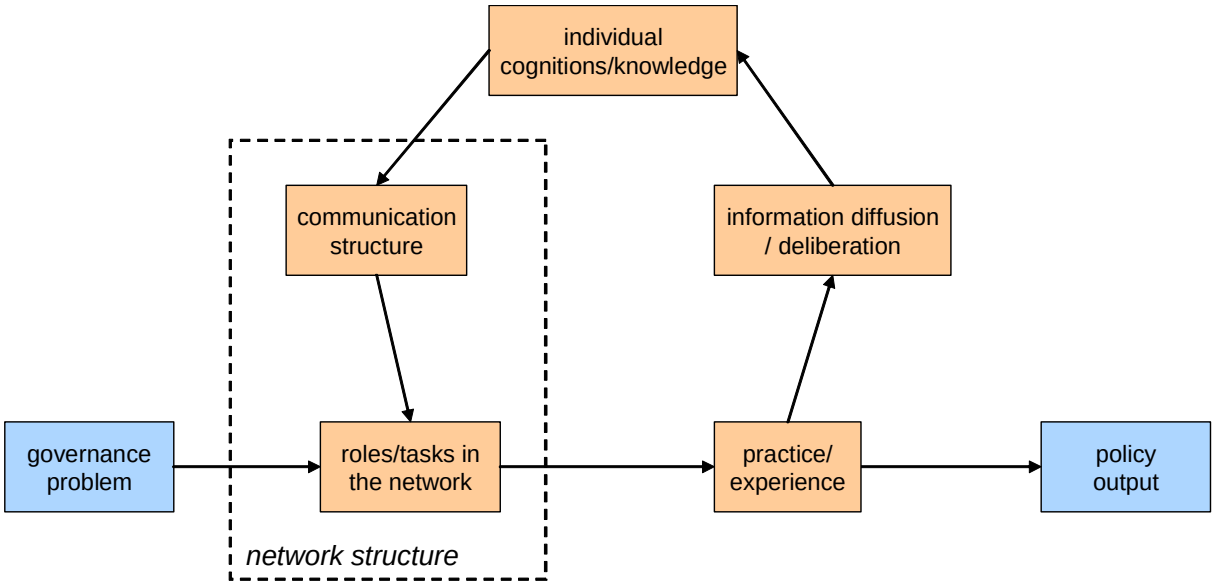

Figure 1: Conceptual model of the role of networks and institutional learning for sustainability transitions. Adapted from Newig and Günther 2005.

Third-order learning, however, changes the entire network structure. Third-order learning as a shift in the paradigms of the network usually occurs in a formation or re-formation phase of the network (Döhler 1994, Hall 1993). Stable relations are cut, while others are established. New actors may be incorporated and others will leave the network. Moreover, changes caused by first- and second-order learning can also be observed. All this leads to changes in all presented network characteristics.

To conclude the structural changes of a network due to learning events, it is evident that the most fundamental changes in networks are caused by institutional learning (understood as third-order learning). Individual and collective learning leading to first- and second-order changes influence networks in their nature of the relations and the density, but do not change

the fundamental network structures. Learning occurs within the chosen paradigm of the network. But it can also influence the stage of the network in its life cycle.

3. How do institutional learning and network governance help to formulate and implement policies in the context of environmental change?[1]

The first hypothesis we put forward is that learning through network governance enhances the quality of environmental policy decisions. The main mechanism that can be assumed is that, in the course of the collective learning process, information is generated or made available that would not have been so otherwise, and that, furthermore, the decision benefits from this information, i.e. the information is actually incorporated into the decision. Thus, it seems plausible that environmental decisions can benefit from the factual knowledge of involved actors about their (local) conditions (López Cerezo and González García 1996; Pellizzoni 2003: 218 with further references; Yearley et al. 2003), assuming that those who are closest to a problem develop the best understanding of it (Steele 2001, 437; Thomas 1995, 10). Furthermore, there may be information that 'emerges' from the close interaction of actors in a group process. Many authors stress the emergent effects of collective learning, the plurality of perspectives and the thus more creative decision-making as characteristics of participatory decision-making (Linder and Vatter 1996, 181; Doak 1998; Mostert 2003; Pahl-Wostl and Hare 2004). Yet group processes also have the potential for adverse effects. For instance, Cooke 2001 points out problematic findings from social psychology regarding consensus-oriented group processes, such as the tendency towards taking risky decisions or an immunisation towards independent and critical arguments. Which of these mechanisms prevails in a given context seems to be empirically not fully clear at present. Another type of information from which decisions could benefit is information regarding the extent to which planned measures will be accepted by the addressees. In this respect, participation of actors in network governance becomes an "instrument for the anticipation of resistance to planning and implementation" (Linder and Vatter 1996, 181).

Second, it can be argued that network governance leads to enhanced compliance and implementation of environmental decisions. The key mechanism is that the implementation of and compliance with a decision depends positively on the degree of acceptance, or even identification, on the part of the addressees (see, e.g. Webler and Renn 1995: 23 with further references; Bulkeley and Mol 2003: 151). Acceptance may firstly be supported by providing the interested actors with early and comprehensive information, as is standard in network governance approaches. This may prevent actors from feeling left out or passed over and create a sense of involvement and belonging. Also, certain educational effects, e.g. in the sense of an improved environmental awareness, can play a role (see Ryffel 1972: 240-1). Moreover, an intensive involvement of the concerned actors in a (deliberative) decision process that is perceived as fair and is based on mutual communication is expected to enhance the acceptance of the decision. This even holds when the result does not correspond to the actors' expectations (Creighton 1981; Thomas 1995: 8-9; Würtenberger 1996, 98 et seqs.), as procedural justice

[1] This section very closely follows the account presented in Newig forthcoming.

research has found that the acceptance of a decision depends crucially on aspects of fairness of the decision procedure (Lind and Tyler 1988; Tyler 1990; Bulkeley and Mol 2003; Murphy 2004). Furthermore, a decision that involves conflicting interests is more likely to be accepted by the different parties if it is based on either a consensus or at least a compromise to which most of the parties agree. This in turn is most likely to require an intensive deliberative process that allows the concerned actors to effectively claim their stakes, but also a spectrum of interests that does not fundamentally rule out any consensual solutions. Furthermore, in the medium and long run, building trust relationships between both the involved non-state actors and between non-state and state actors in the network (Shindler and Aldred Cheek 1999; Mostert 2003) can lead to an increased regional collective social capital and can thus influence the context of future decision processes. In particular, building trust can improve acceptance of and thus the willingness to comply with measures, as empirical studies in other contexts have shown (Murphy 2004).

IV. Conclusions

In this contribution, we have presented some preliminary thoughts on the mutual relations between network structures, institutional learning and effective policy outputs. It has proven crucial to distinguish between different functions of a network that contribute to collective learning. Thus, different network characteristics may be more or less suitable regarding different network functions. While, for example, highly centralised networks may be well suited for the efficient transmission of information, they are less suitable for enabling deliberation and moreover tend to be less resilient to abrupt change. Regarding the network structure as the dependent variable, we have shown that different 'depths' of learning (single- or double-loop) influence network structures in different ways. Ultimately, network structure and learning appear to mutually influence each other, leading to learning cycles that involve both cognitive and institutional factors. They potentially affect the performance of network governance in two ways. Thus, environmental effectiveness can be enhanced by more informed and more creative governance decisions, incorporating a wider variety of knowledge and values, and by better acceptance of decisions by the target actors that participated in network governance, and thus better compliance and implementation.

While we basically believe that relating Social Network Analysis to collective learning and governance issues seems extremely promising, we are well aware of its shortcomings. For network analysis can only provide a static picture of network structures but does not reflect its dynamics. Moreover, social network analysis does not include the learning object (what is learned by the actors) and the consequences for action and behaviour. Whereas Social Network Analysis as such is already highly developed, its conceptual application for learning and governance processes is still at the initial stage, let alone the desiratum of empirical research. We would therefore like to encourage fellow researchers to join our efforts in this promising area of research.

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