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### The Right Connections

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*Published in:*  
 Ecology and Society

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
 Publisher's PDF, also known as Version of record

*Publication date:*  
 2010

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Crona, B., & Hubacek, K. (2010). The Right Connections: How do Social Networks Lubricate the Machinery of Natural Resource Governance? *Ecology and Society*, 15(4), [18].

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Guest Editorial, part of a Special Feature on [Social Network Analysis in Natural Resource Governance](#)  
**The Right Connections: How do Social Networks Lubricate the Machinery of Natural Resource Governance?**

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Key Words: *governance; natural resources; social network analysis; social relations; structure*

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Adaptation and mitigation to global as well as local environmental problems calls for the transformation of many contemporary and unsustainable governance approaches. For much of human history, natural resource governance centered on efforts to control nature to harvest products from it, while reducing risks to society. The central tenet was to achieve predictable outcomes, a strategy that almost invariably led to reduced biological diversity and a reduction of the range of variation in natural systems. However, reduced diversity in turn tended to create more sensitive systems, both ecological and social (Levin 1999 among others). From the 1970s and onward (Holling 1973, 1978), the notion that such attempts to control highly complex and nonlinear systems invariably leads to surprises and/or societal and environmental crises gained increasing momentum (Holling and Meffe 1996). On the basis of these arguments, conventional command-and-control resource management became heavily criticized (Holling and Meffe 1996, Wondolleck and Yaffee 2000, Folke et al. 2005, among many others) and several approaches have been proposed to overcome its limitations. These include, among others, adaptive management (e.g., Holling 1978), cooperative management (e.g., Pinkerton 1989, Jentoft 2000), collaborative management (Borrini-Feyerabend and Borrini 1996, Wondolleck and Yaffee 2000), adaptive comanagement (Ruitenbeek and Cartier 2001, Olsson et al. 2004), and adaptive governance (Folke et al. 2005).

The concepts outlined above share many similarities and combined they can be said to identify two principal elements for overcoming the limitations of command-and-control approaches: focus on continuous learning, achieved through the inclusion of multiple sectors of society and their diverse sets

of knowledge. However, achieving this new form of resource governance is dependent on a fundamental understanding of important social processes at play. Thus, scholars have recently started to take an interest in how relationships among different actors and stakeholders facilitate and hinder societies in transforming the way they manage natural resources. Many attempts at sustainable resource governance have failed because of inadequate attention to the role of social relationships in shaping environmental outcomes. In other cases, new governance initiatives emerge and develop as a result of social ties forming between previously unconnected actors. In response to these realizations, analysis of social networks has gained increasing attention and is coming to the fore in studies of social-ecological systems and natural resource governance (Bodin and Crona 2009). There is also an increasing recognition of the importance of understanding the flows of resources and information through social systems to support the governance of natural resources, to contribute to social learning, and to enable development of integrated policy approaches. A growing body of empirical work is beginning to emerge around these topics and in this special issue we bring together a set of original papers that in different ways address social networks and how our appreciation of their structure can enhance understanding of natural resource governance.

This special issue rests on the assumption that a move away from command-and-control implies a move from government to governance, and from political administrative hierarchy to various types of collaborative structures (for example, Kickert et al. 1997, Koppenjan and Klijn 2004) and structures that are more attuned to the requirement of ecosystems operating at various spatial scales. This

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requires a shift in perspective concerning how governance systems should be designed. Empirical studies suggest that collaborative arrangements, which involve a multitude of actors from various sectors and user groups, are more likely to establish adaptive processes than other types of systems (Pinkerton 1989, Ostrom 1990, Bromley 1992, Baland and Platteau 1996, Rova 2004, Sabatier 2005). Such structures have been variously referred to as governance networks or comanagement structures. It is often suggested that such networks of actors provide arenas for learning and problem solving, and as such, also benefit conflict resolution (Carlsson and Berkes 2005) but we still know rather little about how different kinds of comanagement structures relate to adaptability.

In this special issue, Newig, Günther, and Pahl-Wostl explore this topic by reviewing the literature on governance networks and elaborating on how these networks can promote learning and which network structures are most likely to promote learning at different scales. In doing so, they draw attention to structural characteristics of networks as a whole rather than to actor-related network measures. One of the unique contributions of this paper is their move toward integrating the collective learning and network governance literature with social network analysis approaches. This allows them to sharpen the concept of learning in networks by employing formal network analysis measures and to formulate hypotheses relating to network properties and learning.

In a similar vein, Hirschi discusses relational aspects of the concept of sustainable development and focuses particularly on the question of how fragmentation and cohesion of local actor networks may foster or hinder a sustainable development. Comparing two park project initiatives in Switzerland, he analyzes the changing structure of collaborative networks over time and finds that policies that promote a move toward network governance approaches appear to have strengthened vertical collaboration, but found that horizontal collaboration remains to be improved. However, Hirschi also notes the strong influence of history and context in the development of governance networks and the impact that dominant actors at the onset of an initiative can have on the subsequent development of the network.

In the face of increasing global and environmental change we must ask ourselves if certain network

structures are more likely to foster adaptive governance than others. Sandström and Rova explore this challenging question by examining comanagement networks, and how they shape the institutions that develop for resource management of two fishery conservation areas in Sweden. Using a bottom-up, comparative approach Sandström and Rova study how structural properties of comanagement networks relate to adaptability of fisheries comanagement systems. They find that low density networks, i.e. networks containing few connections between actors, in one of the areas are associated with lower potential adaptability, reflected in the divergence and competition of perceptions, goals, and interests, which leads to absence of a common problem definition and prioritizing process. This in turn appears to have hindered effective rule-making and decreased legitimacy for formal management rules. The lower cohesiveness of the network also appears to be related to disparate views concerning the condition of the resource, such as the size of fish stocks or how to utilize the resource. Sandström and Rova therefore conclude that the notion that denser networks of heterogeneous stakeholders promote bridging of disparate perspectives and formulation of a common view of the ecosystem as well as appropriate management actions is still a sound hypothesis.

Because collaborative governance ultimately depends on social relations, it is important to recognize that actors other than those with formal authority and holding formal positions might be involved in management (Sabatier 1986, Carlsson 1996). The actual comanagement network in place might therefore not correspond to formal comanagement structures. Similar to the approach of Sandström and Rova, Prell and her colleagues Birch, Hubacek, and Reed examine the competing role of formal and informal social structures in shaping perceptions around land management practices. Their findings, based on research in a protected area in Yorkshire, UK, challenge the idea that formal structures and organizational culture exert the strongest influence on individuals' perceptions, and instead point to the role of informal structures, in the form of social networks, in shaping ideas about land management practices. Their data suggests that the stronger the social tie, the more similar perceptions the actors tend to have. Their contribution also points out the practical implications and usefulness of these findings for comanagement initiatives by highlighting that when

the aim is to bring together diverse views and opinions, selecting stakeholders from different organizations and sectors is simply not enough. Neither is it enough to simply find those stakeholders who represent different stakes. Instead, practitioners need to come to grips with the fact that individuals are embedded in social ties, and that it is these ties that are constraining and influencing peoples' perceptions about management practices.

Another interesting use of social network analysis to understand the interplay between formal and informal structures, is provided in the study by Sean Downey. Using social network analysis, he is able to challenge the conventional static view of swidden agriculture as highly constrained by a linear relationship between population growth and land use, invariably resulting in overexploitation. Instead, by combining network analysis with the adaptive cycle and panarchy framework (Gunderson and Holling 2002), he shows that these agricultural systems are highly dynamic and that part of their adaptability in a contemporary socioeconomic context lies in the social networks of labor exchange and the farming practices they sustain. The network perspective allowed him to shift focus from the reciprocal exchange of labor between pairs of farmers to the global effect that the village's network of labor relations has on potential land use rates, and thus environmental impact. A network that leverages reciprocity to clear land can, under some circumstances, also limit clearing when exchanges are unrequited. Examining whole labor networks in five communities, Downey thus shows how the social norm for labor reciprocity among the Q'eqchi' Maya creates dependencies that can also limit the ability of individuals from overusing shared forest resources, even in the absence of formal institutions.

Examination of social structures, be they formal or informal, offers many new insights relevant for natural resource governance. These insights can consist of identifying social structures that either facilitate adaptive governance processes, or social structures that in different ways hinder a move toward more sustainable resource governance practices. The contribution by Ernstson, Barthel, Andersson, and Borgström relates to the former. In their meta-analysis of social and ecological network studies, they show how these studies can be combined to identify scale mismatches of relevance for resource governance. They achieve this by

focusing on the social practices by which actor groups interact with ecosystem processes, and by locating the spatial scales at which these interactions take place. Using seven case studies from Stockholm, they illustrate the unrealized potential of brokerage positions in the urban social-ecological landscape at the mesoscale relevant for improving learning and coordination of activities for maintenance of ecosystem services such as seed dispersal and pollination. Most governance frameworks developed within the context of natural resource governance have not dealt very explicitly with space, e.g., polycentric structures (Ostrom 1998), multilevel, collaborative, and adaptive governance (Folke et al. 2005, Pahl-Wostl et al. 2007, Duit and Galaz 2008), and learning networks (Manring 2007). What is innovative about the framework proposed by Ernstson et al. is that it attempts to articulate the fact that ecosystem governance necessarily takes place in relation to specific localities. This means that the physical location of ecosystems, their associated actor groups, and their arrangement in space all influence ecological processes.

In contrast to the contributions by Ernstson, Downey, Hirschi, Newig and their colleagues, which focus on social structures that enhance resource governance, Crona and Bodin explore social networks to identify social structures that potentially hinder transformability. In their study of a small-scale fishery suffering from continued decline and habitat degradation, they use social network analysis to identify informal power structures in the form of gear exchange networks. To understand how power and knowledge may interact to affect resource governance outcomes, they combine analyses of networks used for ecological knowledge transfer and informal power structures in the form of gear exchange networks, and explore the role of central individuals. Their findings show that power and knowledge tend to accrue to the same individuals who can be described as opinion leaders because of their potential influence in guiding knowledge generation and initiation of collective action. Their study shows that the characteristics of these opinion leaders are therefore likely to have a significant impact on the ability of the community to initiate much needed transformation of local fisheries governance.

All the contributions to this special issue in different ways illustrate how studying social networks, i.e., the patterned relations linking actors together, can

help understand the two fundamental cornerstones of adaptive governance: collaboration and learning, as well as the institutions that structure and influence these processes. However, as alluded to above, the use of social network analysis to enhance understanding of adaptive governance approaches is still a young enterprise and much work remains before we will fully understand how relations among actors, and the structuring of these relations, affect natural resource governance outcomes. This special issue is only one step in a much broader effort of uncovering these relationships and we hope it will inspire more researchers to take on this necessary and intriguing challenge.

Responses to this article can be read online at:  
<http://www.ecologyandsociety.org/vol15/iss4/art18/responses/>

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### Acknowledgments:

We would like to thank all the authors for their hard work in contributing to this issue. The work of Beatrice Crona has been supported financially by the Swedish Research Council Formas.

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