

CHAPTER 11

CROSS-SCALE INSTITUTIONS & BUILDING RESILIENCE IN THE CANADIAN NORTH

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INTRODUCTION

In areas experiencing social and environmental transformations, such as the Canadian North, there is a need to develop the capacity to respond and adapt to change, and to explore policy directions that can help build resilience to deal with change. In the area of environmental management, Folke *et al.* (2002) have suggested that the creation of flexible multi-level governance systems that can learn from experience and generate knowledge to cope with change may be one such policy direction. The response of the community itself, through its own institutions, is key to effective adaptation to change, but support from regional and national governments is also important in the creation of multi-level governance.

Berkes and Jolly (2001) have argued that co-management institutions in the Canadian western Arctic under the *Inuvialuit Final Agreement* (IFA) have the potential to provide such multi-level governance. These institutions are instrumental in relaying local concerns across multiple levels of political organization. Participatory management has the potential to enhance local adaptation capabilities by shortening the links between different decision-making levels. Co-management mechanisms evolving in the Canadian North, especially when they take into account local and traditional environmental knowledge, speed up communication and bridge different systems of knowledge. Tightly coupled systems (*i.e.*, those involving close feedback relationships) reduce the response time to change, a necessary but not a sufficient condition for successful adaptation.

In most areas of social and environmental management, responding to change is rarely a one-step solution. More likely, it is an iterative process of learning-

by-doing, or adaptive management (Holling 1978; Lee 1993; Kristofferson and Berkes, this volume). Since complex systems tend to be characterized by high degrees of uncertainty, policies and actions at any one time are necessarily based on incomplete information, and management is modified iteratively as understanding evolves.

The use of indigenous perspectives to guide such adaptive management is important in that northern peoples are often experts in learning-by-doing. Both scientific management and traditional management systems can learn from one another and from their joint experience with resource management issues. Learning across institutions is key (Diduck *et al.*, this volume); this is learning at the level of community institutions (such as hunter and trapper committees), regional organizations, national organizations, and international organizations such as the Arctic Council.

In this chapter, we use cross-scale analysis to deal with institutions at various levels – local, regional, national, international. There are two main ways in which these institutions may be linked across scale. Using terminology from Young (2002) and Ostrom *et al.* (2002), cross-scale linkages may be *horizontal* (across geographic space) or *vertical* (across levels of organization). It has been hypothesized that cross-scale linkages, both horizontal and vertical, may speed up learning and communication, thereby improving the ability of a society to buffer change, speed up self-organization, and increase capacity for learning and adaptation (Berkes 2002).

The use of adaptive management and the creation of multi-level governance (or co-management) systems is a shift from the usual top-down approach to management. It will not solve uncertainties inherent in change but will help deal with those uncertainties in an institutional context that encourages learning and adaptation. This is the essence of the resilience approach. Managing for resilience enhances the likelihood of sustaining nature and society in a changing environment in which the future is unpredictable. Resilient social-ecological systems are those that are able to absorb shocks without collapse. Building resilience means nurturing diversity, creating options, and increasing the capability of the system to cope with uncertainty and surprise (Berkes *et al.* 2003).

The concept of *resilience* provides a window for the study of change. The resilience of a system is defined in terms of (1) the magnitude of shock that a system can absorb and still remain within a given state, or the ability to buffer disturbance; (2) the self-organization capability of that system, and (3) its capacity for learning and experimentation (Folke *et al.* 2002; Resilience Alliance 2004). The first attribute of resilience is difficult to study directly. Hence, the other two attributes may be used as rough measures of resilience.

The objective of this chapter is to explore the idea that cross-scale linkages help deal with change by building resilient systems. Using several resource management cases, we approach this objective by analyzing the mechanisms by which resource management systems build capacity for self-organization,

learning, and adapting. The Canadian North is an appropriate setting in which to address the objective because of the existence of a number of experiments in cross-scale management through land claims agreements. We explore the objective with reference to the following questions:

- 1 Land claims based co-management connects local-level institutions and government agencies. What are the mechanisms by which co-management may contribute to learning and self-organization across levels of political organization?
- 2 Local experts (traditional knowledge holders) and scientists have been interacting in co-management committees, working groups, and conferences. What is the role of improved communication through sharing knowledge and views? How can traditional knowledge and science be combined toward more resilient systems?
- 3 A number of cross-scale linkages have been created through co-management arrangements. How do these horizontal and vertical linkages function in dealing with resource and environmental management problems?

The chapter explores these questions through a consideration of five cases or examples: co-management in the Inuvialuit region under the Fisheries Joint Management Committee (FJMC); the West Side Working Group (WSWG) fisheries traditional knowledge study; management of narwhal in Nunavut; management of polar bears across the Arctic; and the effort to deal with persistent organic pollutants (POPs) in the Arctic. Through these cases, we look for lessons and insights regarding building capacity for self-organization, learning, and adapting.

CO-MANAGEMENT IN THE INUVIALUIT REGION

In the Canadian western Arctic, co-management institutions, evolving since the signing of the *Inuvialuit Final Agreement* (IFA) of 1984, provide cross-scale linkages for feedback horizontally across the region and vertically across levels of organization from the local Hunter and Trappers Committees (HTCs) to regional agencies and beyond. These linkages have the potential to facilitate the transmission of community concerns, such as those about food chain contaminants and climate change, to the regional, national, and international levels (Berkes *et al.* 2001), and thereby help northern societies to respond to environmental problems.

Resource co-management, or the sharing of power and responsibility between the government and local resource users, emerged through the settlement of land claims in northern Canada. Under the *Inuvialuit Final Agreement*, a series of co-management boards were created in the Inuvialuit Region, Canadian western Arctic (see Figure 5.1). One of these is the FJMC. It consists of two Inuvialuit representatives, two government-appointed representatives, and a

rotating chair (Fast *et al.* 2001). The FJMC is a consensus-based organization. Quarterly meetings and teleconferences help to ensure that information is exchanged among members of the board, engaging the FJMC in joint problem solving and adaptive learning.

The FJMC can address different concerns, from local fishing issues to regional oil and gas development policy. This is because the FJMC communicates with the HTC in each of the seven IFA communities and directly advises the Minister of the Department of Fisheries and Oceans (DFO) on matters pertaining to fisheries and marine mammals in the region. An annual 'community tour' and meetings with the minister help the FJMC to facilitate sharing information and concerns among the various levels of governance. By dealing with a broad range of issues (*e.g.*, monitoring and harvest information for fish and marine mammals, cross-boundary issues, combining scientific and traditional knowledge), the FJMC is able to garner an in-depth perspective regarding fisheries management issues.

Incorporating local perspectives is an essential component of co-management, enabling local systems to be recognized and legitimized. Decisions requiring local input include data gathering, harvesting and allocation decisions, local knowledge, long-term planning, and inclusive decision-making (*e.g.*, Pinkerton 1989). Participatory approaches are essential for the consideration of multiple perspectives on management issues and for the inclusion of local and traditional knowledge in management. In participatory management, not only *what* information is included, but also *how* local perspectives are incorporated into the decision-making process become important. Communities need to have the capacity to set their objectives and know what work they want done at the local level.

Co-management needs to be experimental and flexible so that both local-level and government-level institutions can learn from their mistakes and gradually build capacity to deal with new circumstances and change in general. The Beaufort Sea Beluga Management Plan under the IFA illustrates how the adaptive management perspective of Holling (1978) may be combined with the idea of co-management, in what might be called an adaptive co-management approach. The FJMC, in co-operation with local HTCs and the DFO, developed the Beaufort Sea Beluga Management Plan that is widely supported throughout the region even though compliance is voluntary (FJMC 2001).

With the recent increase in oil and gas exploration in the Beaufort Sea region, the FJMC is searching for a 'legislative fit' to help with formal policy recognition for this plan. For example, under the 1997 *Oceans Act* there is the provision for taking a flexible planning approach in creating marine protected areas (MPAs) (Fast *et al.* 2001). Creating an MPA in the Beaufort Sea beluga areas is being considered as one way to guarantee protection for the beluga as interest in oil and gas development builds in those areas. This is an example of how management can be adaptive. The FJMC started with an informal management plan that is working and, in response to development pressures, moved to the use of new and existing legislation for beluga protection.

Table 11.1
MEMBERS OF THE WEST SIDE WORKING GROUP OF
THE FISHERIES JOINT MANAGEMENT COMMITTEE, THE INUVIALUIT REGION

Aklavik HTC:	local agency
Aklavik Elders Committee:	local agency
FJMC:	regional agency; coordinating role
DFO:	national agency
Parks Canada:	national agency

Co-management is meant to establish a dialectic process, functioning not only from the top down but also from the bottom up (McCay and Jentoft 1996). Co-management arrangements can take many forms, depending on the issues and context. The work of the FJMC demonstrates how an adaptive co-management approach enables changes in the locus, scale, and scope of decision making to be made appropriately, depending on the issue being addressed. The inclusion of local perspectives, which are often not heard, is an integral component of any co-management system. Indigenous forms of communication and organization are vital to decision-making processes that take into account local-level knowledge, as illustrated by the next example.

USING TRADITIONAL KNOWLEDGE FOR FISHERIES MANAGEMENT

The FJMC has been conducting traditional knowledge studies to feed into fisheries management plans that incorporate both traditional and scientific knowledge. The WSWG, with the facilitation of FJMC, was formed to initiate a traditional ecological knowledge (TEK) fishing study for the rivers west of the Mackenzie River to the Yukon-Alaska border (Figure 5.1). Representatives from the Aklavik HTC, the Aklavik Elders Committee, the FJMC, the DFO, and Parks Canada all sit on the board of this working group, chaired by a representative of the Aklavik HTC (Table 11.1).

The FJMC, knowing that there would be multiple objectives to be satisfied from a TEK study, facilitated a process to support both community and scientific priorities. The objectives of the TEK fishing study included (a) a traditional knowledge component related to the local context and based on Inuvialuit oral histories, and (b) a scientific component, using TEK related to fish biology and habitats, that could contribute to the fisheries management plan. The unwritten objective of this research was to facilitate a process among stakeholders (*e.g.*, community experts and fisheries scientists) that would enable learning. Because the FJMC coordinates multiple levels (local-regional-national) and is a respected co-management body, it was able to bring together people and institutions that normally do not collaborate.

The TEK Fishing Study, carried out during February and March 2002, enabled elders and others to share their knowledge of fish species, fishing methods, and changes in species over time. Since fishing is part of a series of land-based

Table 11.2
SOME CHANGES AFFECTING FISHING IN THE AREA FROM THE MACKENZIE RIVER TO THE YUKON-ALASKA BORDER (the “West Side”)

1930s	RCMP posts/stores began closing; good muskrat trapping opportunities in the Delta; by the 1940’s most people move towards Aklavik.
1960s	Introduction of the snowmobile; fewer and fewer dog teams (last in early 1970s); less people fishing (catching less fish).
1980s	Changes in water levels and fish migrations; closing of Fish Hole; after-effects of oil and gas development.
1990s	People returning to the coast, <i>e.g.</i> , Shingle Point; only some people are fishing now.

activities undertaken by the Inuvialuit, a story emerged blending the history of fish and fishing practices with the impacts of other influences in the region. A historical perspective sheds insight as to why fishers have changed their fishing locations and practices. For example, as more people moved toward Aklavik and the Mackenzie River Delta to pursue muskrat-trapping opportunities, the coastal areas became less frequently used. With the introduction of the snowmobile, it became less important to fish for dog food. Many changes have affected the Inuvialuit, and understanding changes in fish harvesting is only part of a much bigger story (Table 11.2).

The TEK Fishing Study generated a wealth of information. From an historical perspective, a better understanding emerged of how people fished in relation to other activities on the land. Changes such as market prices, introduction of the snowmobile, and more recently global warming have impacted where and how people fish. Although fishing intensity declined with the snowmobile and the closing of fishing on the Big Fish River for conservation reasons, families are returning to Shingle Point and Running River in recent years to fish during the summer months. Perhaps char and herring are less abundant (or less harvested) along the coast, but more freshwater species are being caught. Physical changes in the landscape such as erosion (due to permafrost thaw) are also affecting fishing. The water in some coastal areas is said to be far less salty than before. The results of this study illustrate how people remain in touch with their landscape, and just how much local knowledge exists about particular resources and places.

The synthesis workshop at the end of the first phase of the TEK Fishing Study enabled elders and members of the West Side Working Group to learn from each other. Elders from different communities who had once fished in the area were able to share stories (something that does not happen as often as one would think!) and to generate more information about their experiences on the land. When thinking about potential fisheries management, elders suggested measures be taken to (a) protect “fish holes,” *i.e.*, stop development in intensive fishing areas; (b) leave the spawners; (c) remove diseased fish to prevent pollution of the system; and (d) use common sense. Elders wanted to ensure that

Table 11.3
PRINCIPLES IN ARTICLE 5 OF THE NUNAVUT LAND CLAIMS AGREEMENT OF 1993

- 1 Inuit are traditional and current users of wildlife;
- 2 The legal rights of Inuit to harvest wildlife flow from their traditional and current use;
- 3 The Inuit population is steadily increasing;
- 4 A long-term, healthy, renewable resource economy is both viable and desirable;
- 5 There is a need for an effective system of wildlife management that complements Inuit harvesting rights and priorities, and recognizes Inuit systems of wildlife management that contribute to the conservation of wildlife and protection of wildlife habitat;
- 6 There is a need for systems of wildlife management and land management that provide optimum protection to the renewable resource economy;
- 7 The wildlife management system and the exercise of Inuit harvesting rights are governed by and subject to the principles of conservation;
- 8 There is a need for an effective role for Inuit in all aspects of wildlife management, including research; and
- 9 Government retains the ultimate responsibility for wildlife management.

coastal areas are protected and managed so that future generations can continue to experience the landscape and fishing activities. This process enabled DFO scientists and others to better understand how local knowledge can contribute to resource management by providing contextual information, local detail on resources, and baseline data. The report produced from the TEK study is being used as the baseline to which the DFO will add scientific data.

The example illustrates how a co-management body can help to foster relationships across several levels. The FJMC, through its coordinating role, enables various players to communicate in order to learn from each other. Resilience is enhanced within this system through feedback mechanisms; as stakeholders begin to learn and to understand different worldviews, better management planning is possible. Prior to coordinating the wswg, communication between scientists and community members was limited. The creation of the wswg and the TEK study has enabled a dialogue to begin, an important step for mutual learning. Next we turn to the Nunavut region and a case on narwhal management.

INSTITUTIONAL DYNAMICS OF NARWHAL MANAGEMENT IN NUNAVUT

Historically, quotas for narwhal have been set by the DFO and have remained relatively static since 1977. This centralized management approach, and top-down quota allocation process, has typically not been responsive to Inuit desires for increased quotas, or assertions by hunters that narwhal populations have been increasing (Diduck *et al.*, this volume). Thus, until recently, key local and regional organizations have had a limited influence on the narwhal management process.

However, consistent with the principles articulated in the *Nunavut Land Claims Agreement* of 1993 (Table 11.3), an experimental community-based narwhal management process was established in five communities in the region in 1999. This process has been encouraging more effective cross-scale institutional and organizational linkages. In particular, the community-based narwhal

The DFO is linked to national and international narwhal issues, including coordination with Greenland.

The department of Fisheries and Oceans and the NWMB link federal and Inuit priorities. As the claims implementation organization, Nunavut Tunngavik Inc. plays a limited management function but is the 'voice' of the Inuit.

As a co-management entity created under a land claim, the Nunavut Wildlife Management Board plays a central role linking local, regional and national scale priorities.

Regional wildlife organization in Nunavut mediate concerns among HTOs in the Keewatin, Kitikmeot and Kivalliq (Baffin) regions.

Community-based hunters' and trappers' organizations reflect local values and goals, and can provide traditional knowledge that is transmitted to the NWMB.

The horizontal linkages among HTOs vis-a-vis narwhal management are less formalized.

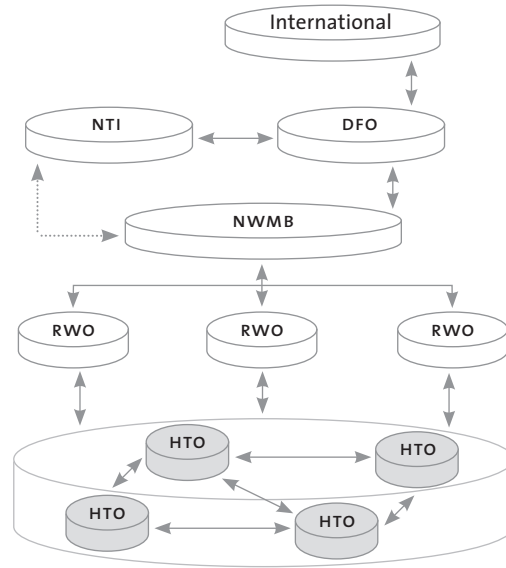


Figure 11.1 Community-based narwhal management process in Nunavut.

management process is fostering greater participation among stakeholders, devolving decision making to community-level institutions, and encouraging the integration of Western science and traditional knowledge in decision making. Central to this resource management regime are local Hunters and Trappers Organizations (HTOs), Regional Wildlife Organizations (RWOs), the Nunavut Wildlife Management Board (NWMB), and the DFO, along with Nunavut Tunngavik Incorporated, a claims implementation organization (Figure 11.1).

Under the pilot community-based narwhal management process, DFO-set quotas have been lifted and harvest levels managed by HTOs in each of the five communities. In turn, communities are responsible for monitoring and regulating the harvest (Diduck *et al.*, this volume).

However, there have been difficulties associated with the new management process. For example, the lifting of the DFO quota of 50 narwhal in the community of Qikiqtarjuaq in 1999 resulted in 127 narwhal landed, 40 struck and sunk, and another 79 wounded and escaped. The significant increase in harvest levels, and concerns with harvest methods and the subsequent wastage, led the DFO to temporarily close the Qikiqtarjuaq narwhal hunt in 1999–2000. Despite this apparent setback, the community-based narwhal management process may yet offer much in the way of developing new cross-scale institutional and organizational linkages. Such cross-scale linkages are more likely to transmit priority concerns, issues and knowledge from the bottom up, while linking the regional and national management institutions required to address problems of narwhal management that are not always bounded by convenient jurisdictional scales, geographic space or short time frames.

The community-based narwhal management process is a significant and important management innovation. However, the barriers and constraints to the development of a cross-scale institutional and organizational framework that fosters adaptation and resilience are not insignificant, and there are several interrelated issues that necessitate further analysis.

First, the current process is premised on a notion of 'community,' a notion whose geographic, political, and normative dimensions have not been adequately critiqued. As known from international experience, there are limitations created by class, stratification, conflict, representation, and division of resource use based on gender, ethnicity, and wealth (Agrawal and Gibson 1999; Li 2002). Exacerbating the problem, remote communities throughout the world have been integrated into increasingly privatized, individualized, and commoditized social and economic systems (Brosius *et al.* 1998). Do these concerns apply to Nunavut? The extent to which HTOs reflect or represent a diversity of local goals with respect to narwhal management is largely unexplored.

Second, the manner in which communities in the region are increasingly embedded in extra-local socio-political and economic structures is influencing, among many factors relevant to community-based narwhal management, property rights dynamics and formal governance institutions (*e.g.*, hamlet government). This continues to result in a shift from an historical emphasis on subsistence resource use toward economic growth opportunities, individualized income development opportunities, and the increased commercialization of resource appropriation strategies (*e.g.*, profiting from the sale of narwhal tusks). The point here is not to disparage the motives or rights of Inuit hunters to engage in diversified livelihood strategies, but to illustrate that such poorly understood dynamics influence the development of resilient, cross-scale institutional and organizational linkages.

Third, the current management framework seeks to foster cross-scale linkages by connecting local, regional, and national institutions and organizations. Yet the actual roles of the various management instruments still appear, somewhat counter-intuitively, hierarchical, positional, and competitive in orientation (McCay and Jentoft 1998). Unclear roles and responsibilities and inconsistent communication among individuals and organizations engender interactions among communities and the HTOs, the HTOs and the NWMB, and the NWMB and DFO, that are at times characterized by competition, tension, and conflict. Moreover, despite a policy shift toward devolution, partnership, the use of traditional knowledge, and community-based management arrangements in the Baffin Island region, there is still a tendency among some community members to accept the DFO as the primary source of information, knowledge, and authority regarding key resource stocks because of their historically dominant management role.

Finally, although a significant advance over top-down management, the community-based narwhal management process is still operationalized in a Euro-Canadian resource management framework (Rodon 1998; White 2001).

A Euro-Canadian management framework requires communities to develop formalized management bylaws, monitoring protocols, and reporting practices. To suggest these management requirements are inappropriate is disingenuous; yet, the requirements represent a further, largely unexplored dynamic associated with the development of resilient cross-scale institutional and organizational frameworks. It is also worth noting that the DFO remains the ultimate decision-making authority where narwhal is concerned. In practice, however, interventions by the DFO staff or the minister (*i.e.*, the ‘negative option’ approach) in the management process will become politically less palatable as decentralized management regimes evolve. Consequently, while the innovative framework for community-based narwhal management is seeking to build horizontal and vertical linkages among institutions and organizations necessary for resilient and adaptive decision making, there are several processes and dynamics that require further exploration and analysis.

CROSS-SCALE INTERACTIONS FOR POLAR BEAR MANAGEMENT

In 1973, Canada, the United States, the former Soviet Union, Norway, and Denmark signed the *International Agreement for the Conservation of Polar Bears and their Habitat* (the Agreement). This was spurred by international concern about rapidly increasing harvests of polar bears. The agreement is widely recognized as a success and is considered to have been instrumental in the establishment of effective polar bear conservation regimes throughout the Arctic (Fikkan *et al.* 1993; Prestrud and Stirling 1994; Ross 2000).

In Canada the linkages within and between different levels of the polar bear management system are short and tight, often dependent on a few individuals who work across several levels of the institutional scale, from local to international (Diduck *et al.*, this volume) (Figure 11.2). For example, the same provincial and territorial biologists may be involved in conducting population surveys and writing management agreements at the local level, drafting policies at the territorial level, consulting with the Federal-Provincial Technical and Administrative Committees for Polar Bear Research (PBTC and PBAC, respectively) at the national level, and serving on the IUCN’s Polar Bear Specialist Group (PBSG) at the international level. Federal and academic biologists conduct similar tasks across the same span of the institutional scale. Continuity, shared experiences, and close relationships among this small number of peers have created high cohesion and consistent norms, goals, and standards in the group. The specific roles of key individuals are difficult to assess, but in such a small group they probably contribute substantially to these outcomes.

Despite those many positive attributes, or perhaps even because of them, real access to decision making in the network has generally been selective. Until recently, local stakeholders (mainly Aboriginal) were welcomed at PBTC and PBAC meetings only as observers. This is not to suggest that the dominant actors were unwilling to include them. Canadian polar bear managers have long been sensitive to Aboriginal rights and needs, and indeed were strong advocates for

The Polar Bear Specialist Group coordinates polar bear conservation internationally. Members are government biologists of the five nations signed to the 1973 Agreement; academic biologists, managers, and co-management organizations attend as invited specialists.

The Polar Bear Administrative Committee sets policies and regulations; it consists of senior federal, provincial, and territorial managers.

The Polar Bear Technical Committee coordinates research and management activities and provides technical advice to the PBAC; it consists of government and academic biologists, field-level managers, and representatives of co-management organizations with settled land claims.

Horizontal linkages have emerged to address regionally-specific needs, such as the polar bear management agreement between the Inuvialuit Game Council and the North Slope Borough, and among communities affected by the M’Clintock Channel harvest moratorium.

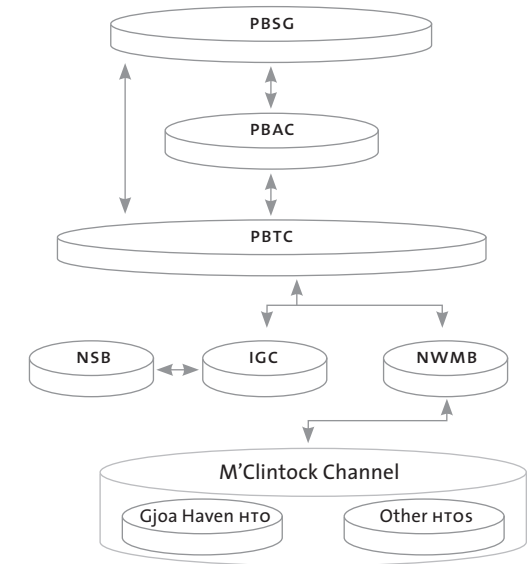


Figure 11.2 Horizontal and vertical linkages among polar bear management institutions.

them in negotiating the agreement (Prestrud and Stirling 1994). Rather, the point is simply that existing network structures predate co-management regimes and tend to change slowly.

Both committees have formalized the participation of co-management bodies as members, but discourse – especially of the PBTC – remains overwhelmingly scientific. Likewise, representatives of Aboriginal co-management organizations attend PBSG meetings as invited specialists, but the group’s outputs (*e.g.*, Wiig *et al.* 1995; Derocher *et al.* 1998; Lunn *et al.* 2002) clearly indicate a dominant paradigm of science-based conservation. This may be changing; the successful Inuvialuit-Inupiat co-management regime in the southern Beaufort Sea (see below) is being brought into the mainstream discourse (Brower *et al.* 2002; Johnson 2002).

In comparison to the vertical orientation of the dominant actors, horizontal linkages (Young 2002) have probably been important for local stakeholders for a long time. The 1988 Inuvialuit-Inupiat Polar Bear Management Agreement is a clear example of such a linkage, empowering both parties and integrating the management efforts of two groups of people interacting with a single, shared bear population. Interestingly, this agreement inverts the usual power relationship between government biologists and local stakeholders by establishing a Joint Commission consisting of two representatives designated by each of the Inuvialuit Game Council and the North Slope Borough Fish and Game Management Committee. The commission appoints a Technical Advisory Committee to review harvest data, research results, and management recommendations, placing biologists in an advisory role to the local actors in the Joint Commission.

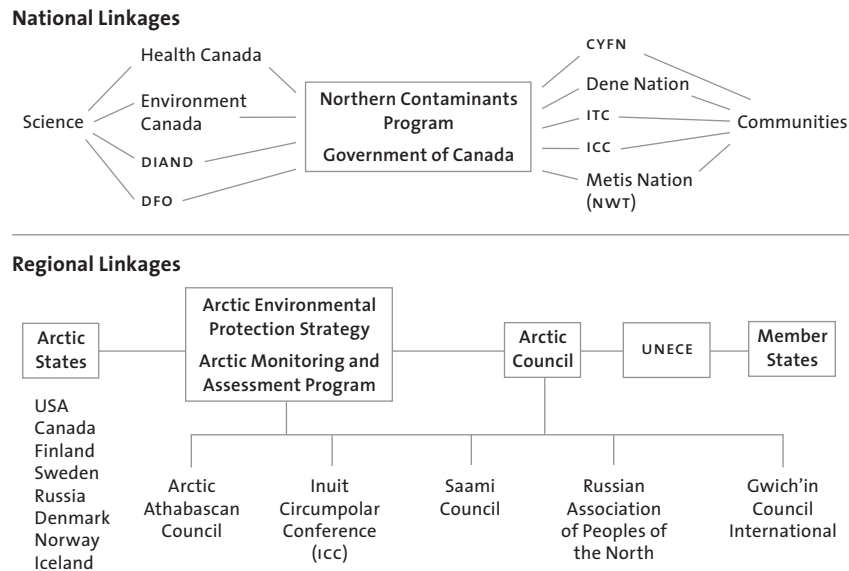


Figure 11.3 Management of POPs: national and regional linkages.

Another example of self-organizing horizontal linkage occurred in the wake of the apparent decline of the M'Clintock Channel polar bear population. In 2002, the communities that harvested that population were invited to hunt bears from an adjacent community whose quota came from a different, healthier population. Such sharing of hunting opportunities fits the pattern of intercommunity trade as an adaptive response identified by Berkes and Jolly (2001) in the western Arctic.

It appears that while the Canadian polar bear management regime was designed with vertical relationships in mind, it is certainly capable of accommodating self-organizing horizontal linkages where they meet local social or ecological needs. Such horizontal linkages seem to be becoming more common, and their development processes may learn from pre-existing linkage mechanisms. For example, the U.S.-Russia *Polar Bear Conservation Agreement* signed in 2000 enables the development of an indigenous peoples-to-indigenous peoples agreement for its implementation. The intent is to model this stakeholder-scale agreement after the existing Inuvialuit-Inupiat Agreement (Johnson 2002).

CROSS-SCALE DYNAMICS AND THE GLOBAL RESPONSE TO POPs

In the mid-1980s, Inuit in northern Canada and university and government scientists came to appreciate that Inuit country food, especially marine mammals, was contaminated by organochlorines (Dewailly and Furgal 2003). Over the next fifteen years, atmospheric chemists and others were able to describe a picture of long-range atmospheric transport of these substances

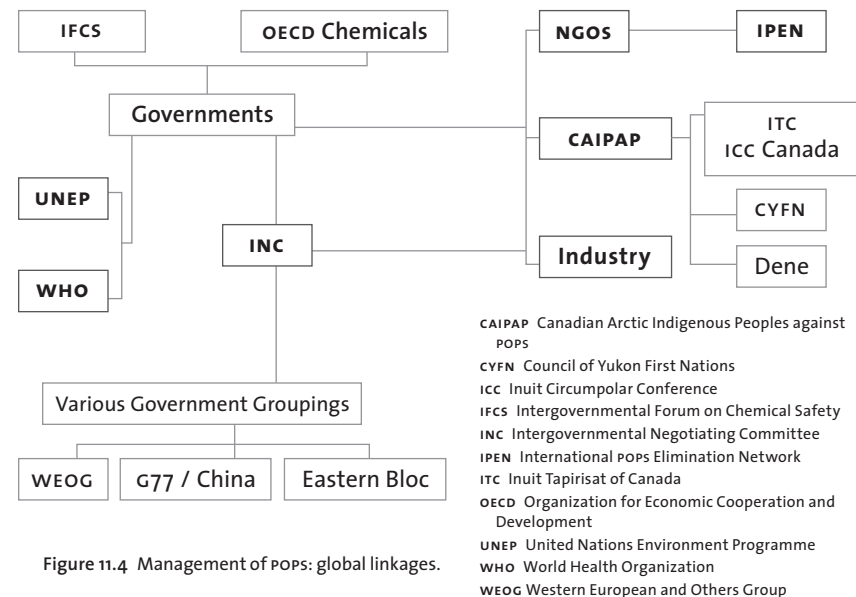


Figure 11.4 Management of POPs: global linkages.

from areas of use in the South to their subsequent deposition in high latitudes (Reiersen *et al.* 2003). Once made available to the northern environment, these persistent organic pollutants (POPs) bioaccumulate in fatty tissues and biomagnify as they move up the food chain.

On 23 May 2001, a diplomatic conference adopted the text of the *Stockholm Convention on Persistent Organic Pollutants* as a global companion to the regional *POPs Protocol* previously adopted in June 1998 under the auspices of the United Nations Economic Commission for Europe's (UNECE) *Convention on Long-range Transboundary Air Pollution* (LRTAP). Both instruments serve to prohibit the production and use of listed chemicals, and in the case of POPs that are an unintended by-product of other industrial purposes (*e.g.*, dioxins and furans), their continuing minimization and, where feasible, ultimate elimination. Both instruments acknowledge the special situation of Arctic ecosystems and of indigenous communities dependent on those ecosystems.

What were some of the horizontal and vertical cross-scale linkages that facilitated this outcome? Figure 11.3 sketches the national and regional linkages, and Figure 11.4 the global linkages. We discuss each in turn.

The identification of the POPs problem as a regional and global issue, rather than just a local issue, coincided with the emergence of a circumpolar Arctic consciousness (Rothwell 1996). Institutionally, this consciousness was reflected in the *Arctic Environmental Protection Strategy* (AEPS) of 1991 and subsequently in the formation of the Arctic Council in 1996. The AEPS laid a fundamental building block for a POPs agreement by establishing the Arctic Monitoring and Assessment Programme (AMAP). But the eight Arctic states recognized that the

UNECE offered a better forum for addressing the POPs issue. Why? The UNECE was better scaled to deal with the issue, as it included eastern and southern European countries as well as the Arctic states, and it also offered a legally binding framework convention that could form the basis for a POPs agreement. The Arctic Council offered neither.

Several features of the national and regional linkages diagram deserve comment (Figure 11.3). First, the Northern Contaminants Program (NCP) of the Government of Canada was instrumental in bringing together three groups: (1) scientists (health scientists, toxicologists, atmospheric scientists) concerned with identifying and describing the POPs problem; (2) key federal government departments (Health Canada, Environment Canada, Department of Indian Affairs and Northern Development, and the Department of Fisheries and Oceans), and territorial and provincial governments; and (3) northern Aboriginal peoples, at least through their national and regional organizations. These linkages were horizontal rather than vertical. Aboriginal organizations were involved in the management of the program, helping to ensure that a comprehensive approach was taken to both ecosystem and human health issues (Shearer and Han 2003).

Second, at the regional scale, Arctic indigenous peoples were involved at all levels. Both AEPS and AMAP were, and remain, unique among comparable international programs in encouraging participation by indigenous peoples. The Canadian NCP and the international fora also served to enhance and create new linkages *between* different indigenous peoples both nationally and, with the collapse of the former Soviet Union, across the circumpolar world.

Third, several factors made it possible to move the POPs issue from Arctic fora to the UNECE. Obviously there was significant overlapping membership between the two organizations at the state level, and Canada and Sweden assumed the task of persuading the ECE to accord a high priority to the POPs issue. But overlapping personal responsibilities were also important. For example, David Stone of DIAND was a key player in the NCP, served as chair of AMAP and became co-chair of the UNECE task force on POPs as part of the lead up to the Protocol. Indigenous people were far less well represented in the UNECE forum than they were in the Arctic fora (Fenge 2003) but nevertheless made a significant intervention (Bankes 1998; Selin 2003).

The scale limitations of a regional agreement were appreciated from the outset and the global POPs negotiations began as the regional POPs negotiations concluded. At the state level, many of the same key individuals (such as David Stone) continued to be involved. Indeed they were also involved in one other set of global chemicals negotiations that had recently concluded (the Rotterdam or PIC *Convention on Prior Informed Consent* (Buccini 2003)). Many of these individuals were also connected through other multilateral chemicals fora such as the OECD chemicals groups and the Intergovernmental Forum on Chemical Safety (IFCS). These fora helped to bridge developed and developing countries as well as NGO and industry chemicals experts, and helped parties form the common premises that allowed the global negotiations to begin (Buccini 2003).

Formally convened under the auspices of both the United Nations Environment Programme (UNEP) and the World Health Organization (WHO), the global POPs negotiations followed the model of most recent multilateral environmental agreements. They were structured around what is denominated an open-ended (meaning open to all states) Intergovernmental Negotiating Committee (INC). Although inclusive at the state level, such negotiations are still state-centred, and thus NGOs, indigenous peoples and industry organizations are relegated to observer, rather than participant, status.

Several features of the global diagram (Figure 11.4) deserve comment. First, NGOs were far more heavily involved (albeit in an observer capacity) in the global negotiations than they had been in the regional UNECE negotiations. A key organization that brought a coalition of NGOs together was IPEN (International POPs Elimination Network). So too were indigenous peoples, and there was extensive collaboration between these two communities. Second, Canadian indigenous peoples formalized their alliance on the POPs issue by forming CAIPAP (Canadian Arctic Indigenous Peoples Against POPs) but also actively engaged (as did industry and NGO representatives) the official Canadian delegation both before and during the various sessions of the INC negotiations (INC 1 to 5). At CAIPAP's request, the official Canadian delegation included a Dene.

Third, the imagery of the negotiations was important in depicting linkages. Presiding, conscience-like, over the negotiations for the entire two years was an Inuit carving of a woman holding a baby. The carving was presented to UNEP Executive Director Topfer by Sheila Watt-Cloutier, President of ICC, at the outset of the negotiations. Topfer in turn presented the carving to John Buccini, the chair of the negotiations. Fourth, while NGO and indigenous representatives served to publicize the negotiations and to keep up the political pressure for a successful outcome, we should not underestimate the critical linkages represented by traditional state groupings in international organizations, *e.g.*, the European Union, the Group of 77 and China. These linkages remain the crucial ones in diplomatic negotiations. But it is also clear that the linkages created by non-state actors can help bridge differences at critical points. One such issue was the elimination of DDT that, from time to time, threatened to scupper the negotiations (Watt-Cloutier 2003). The Inuit made it clear that they did not seek an agreement to protect Inuit mothers at the expense of those exposed to malaria.

DISCUSSION

We started the chapter to explore the idea that cross-scale linkages help deal with change by building flexible multi-level governance systems that can learn and generate knowledge to deal with change (Folke *et al.* 2002). We approached this objective by analyzing the mechanisms by which the capacity for self-organization, learning, and adapting can be built into resource management systems. In all five cases, there are elements of co-management connecting local-level institutions and government agencies, and improved communication through sharing knowledge and views between holders of traditional knowledge



Coastal inlet in James bay, near Chisasibi, Quebec. Photo by Fikret Berkes.

and scientific knowledge. In this section, we focus on cross-scale linkages that enable co-management and communication, first analyzing participatory aspects of management, second noting epistemic communities, and third identifying some shortcomings and constraints.

Aboriginal Participation

All five cases involve cross-scale linkages, but the relative importance of local Aboriginal participation varies across cases, roughly in line with the geographic and political scale of the case. The range is from the fisheries traditional knowledge study (the smallest scale and the most local) to the Arctic-wide POPS case. The FJMC has existed since 1984 and has a substantial track record of indigenous

involvement (Fast *et al.* 2001). The WSWG and the TEK Fishing Study build on that track record. The particular study described in this chapter is one of several TEK fishing studies designed to provide indigenous input for fishery management plans in the region. There is emphasis on Aboriginal participation in the narwhal case as well. The DFO no longer sets the narwhal quota; under the *Nunavut Land Claims Agreement*, communities are responsible for monitoring and regulating the harvest. In the polar bear and the POPS cases, however, Aboriginal participation is less obvious or visible.

The management of polar bears follows the international agreement of 1973 that predates the Inuvialuit and Nunavut agreements. In any case, these agreements do not have specific provisions for polar bears but wildlife co-management in general. The provisions of these agreements have been implemented by formalizing the participation of land-claims-based co-management agencies in the two technical and administrative committees (PBTC and PBAC) for polar bear management. However, the discourse in these committees remains technical and scientific, not very inviting for Aboriginal knowledge and inputs.

In the POPS case, part of the impetus for international action came from the local level, especially following the Broughton Island study of 1989 that showed beyond doubt the extensive contamination of the Arctic with organic pollutants and the serious danger to Inuit health (Myers *et al.*, this volume). The key challenge for northerners was getting the POPS issue on the international agenda. They were able to do this because POPS could be characterized as a human health issue and because AMAP provided a credible information base. This effectively created important feedback linkages that triggered regional negotiations but at the same time confirmed that a regional agreement was by itself inadequate.

Both the POPS story (Downie and Fenge 2003) and the linkages (Figs. 11.3 and 11.4) are complex but they are also informative. The POPS case is a crisis-based issue (as opposed to ongoing management as in the other cases). This provided flexibility and fluidity, allowing the creation of cross-scale linkages. Most of those linkages were horizontal in nature not vertical – because the international system itself tends to be horizontal (Bankes, this volume). The POPS case provides insights regarding national and international politics, the timing of interventions, the strategic choice made by the eight Arctic states for UNECE over the Arctic Council (UNECE provided a better match in scale), the role of key groups (*e.g.*, CAIPAP) and key individuals, and the formation of epistemic communities.

Direct Aboriginal participation in the POPS international fora is not extensive, but it is probably fair to say that vertical linkages have been effective for the people of the North to convey their concerns up the scale. Thus, we see effective communication through vertical linkages and also through horizontal linkages. Some horizontal linkages were highlighted in the POPS story (*e.g.*, new linkages between indigenous groups nationally and internationally). There are likely to be many more examples of these, often self-organized, horizontal linkages in the POPS and other cases, but they have not been explored to any extent.

For example, in polar bear management, there usually are discussions between communities during the establishment of quotas and local management agreements for shared populations. How and where do these discussions take place? How are decisions made – negotiated or by consensus? Aside from the Inuvialuit-Inupiat Agreement, outcomes of horizontal processes have not been well documented or assessed. There is a marked contrast between the vertical orientation of mainstream institutional players (largely governmental) and the horizontal orientation of local-level stakeholders. Is this horizontality a response to power imbalances or is it merely reflective of a different, perhaps more pragmatic, indigenous way of doing business?

Key Players and Epistemic Communities

There is strong evidence in each of the cases (except perhaps the narwhal example) of the role of “key players” who have been instrumental in building cross-scale linkages and in the shared recognition of a problem across scale. Such shared problem identification is the hallmark of what Haas (1992) has termed epistemic communities. Members of such communities share principled beliefs, notions of validity, and policy goals that cut across political boundaries. Two of the cases identify epistemic communities. The first is the expert group identified in the polar bear case, characterized by continuity, shared experience, close relationships among a small number of peers, a high degree of cohesion, and consistent norms, goals, and standards. The polar bear case is significant in that it shows how cross-scale linkages may develop despite the initial vertical design, and how learning may take place.

The second is the grouping brought together by the Northern Contaminants Program of the Government of Canada: scientists (health scientists, toxicologists, atmospheric scientists) concerned with identifying and describing the POPs problem; key government departments; and representatives of northern Aboriginal peoples. Just how cohesive the group was with respect to shared beliefs, norms, and goals has not been explored. There may have been more than one epistemic community, for example, that of atmospheric scientists, health scientists, or circumpolar indigenous groups. An indirect evidence of the existence of epistemic communities, both nationally and internationally, is the apparent transfer of learning from one issue (POPs) to another (climate change).

Shortcomings and Constraints

In addition to providing insights about the significance of cross-scale linkages for participatory management and communication, the case studies also reveal some shortcomings and constraints. We discuss three: the use of traditional knowledge, the long lead times in co-management, and the continuing challenges of implementation.

The first concerns inadequacies in the use of local and traditional knowledge to transcend Western science-based, conservation-oriented, or harvest-oriented management. Only one case shows use of traditional knowledge by design: the

West Side Working Group illustrates how local and traditional knowledge can be used to elucidate the historical context. It highlights the historical dimensions of fishery west of the Mackenzie, land use changes, and how they can be factored into fishery management plans. The narwhal case highlights some of these contextual challenges as well, but there is no management mandate under the *Nunavut Land Claims Agreement* to conduct a narwhal historical study, as there is for the bowhead whale (Hay *et al.* 2000).

In the narwhal case, the use of local and traditional knowledge is limited, and in the polar bear and POPs cases, this seems to be an area of weakness. However, the potential does exist for these cases. Considerable polar bear knowledge exists among the Inuit, and in the case of POPs, local knowledge can complement science in a number of ways. Indigenous readings of signs of environmental quality indicate a range of possibilities, including the construction and use of environmental quality indicators (Cobb *et al.*, this volume) and community-based monitoring (Manseau *et al.*, this volume, and Parlee *et al.*, this volume). Only the narwhal case makes explicit mention of indigenous monitoring, but again the potentials are considerable for all of the cases.

A second constraint that emerges from the case studies concerns the systemic difficulties and long lead times in forging real partnerships of governments and local people. It is well known that it takes a long time to build co-management, some ten years in the case of Pacific Northwest salmon (Singleton 1998) and the Beverly-Qamanirjuaq caribou herd (Kendrick 2000). As these two studies illustrate, the time-consuming aspect of participatory management is building trust among the parties and the development of mutual respect for different ways of knowing. Hence, it is not surprising to see effective cross-scale linkages with the FJMC and the *Inuvialuit Final Agreement*, building on nearly twenty years of joint management experience, and initiatives such as the Beaufort Sea 2000 Conference that facilitated exchange between scientific and traditional knowledge holders and initiated discussion on societal goals (Anon. 2000).

However, even with the wswg case, linkages between Inuvialuit communities and federal government departments were possible only because of the key facilitation role of the FJMC. The larger issue is the historically entrenched conventional, centralized, top-down, regulations-oriented management, based on expert knowledge. Hence the dominant discourse tends to be scientific, as in the polar bear case. Even though there is recognition and respect for native rights, there remain vestiges of a paternalistic approach in the way committees carry out their business and the way roles are defined. The inputs of Aboriginal parties are often hard to detect in the written outputs of the various committees. This is true in the polar bear case as well as in many others; indigenous rights are respected but indigenous voices and messages are not usually heard.

A third constraint is related to the continuing challenges of management and implementation. A key point to the entire discussion is that management must become more flexible and adaptive. Such flexibility is easier at the local level (*e.g.*, FJMC and wswg cases) but more difficult as higher and higher organiza-

tional levels are considered. Making linkages and engaging in negotiations are one thing; regional and global implementation another. With respect to the POPs case, for example, this raises several issues: Can linkages created during the negotiation phase be strengthened? Will they prove to be effective? Can linkages between NGOs and between indigenous peoples be maintained as the issue moves from being an *ad hoc* problem to a continuing one?

CONCLUSIONS

We have emphasized the creation of multi-level governance systems that can learn and generate knowledge to deal with the problems of the North. Social learning typically involves an iterative process of learning-by-doing or adaptive management (Lee 1993). Because of uncertainties in the system, information will always be incomplete. Hence, it is more important for governance systems to be capable of *learning* in this adaptive sense, rather than *possessing* conventional management knowledge and skills to be applied top-down (Folke *et al.* 2002; Kristofferson and Berkes, this volume).

The response of local institutions is key to coping and adapting to change. Conventional resource and environmental management science does not have the methods in its tool kit to deal with complexities and uncertainties. What is needed is a different kind of management regime that goes beyond the received wisdom of centralized management, empowering local institutions for self-organization and adaptive management. The cross-scale linkages provide the connections to, and support from, higher levels of governance, so there is mutual learning and adapting.

Under the various land claims agreements, the Canadian North provides lessons, inviting us to start listening to practical insights and to review mechanisms that are already in place. The cases highlight different mechanisms that have been helpful in building cross-scale linkages that may have some influence on the resilience of linked systems of people and environment. The key is perhaps to identify and build on the appropriate mechanism in different contexts. For example, in the POPs and polar bear cases, there is an internationally sanctioned dimension to the linkages. In the narwhal case, the experimental management regime (if it survives) will end up institutionalizing a new cross-scale approach that promises to be more responsive and resilient to change. However, effective international linkages with Greenland for this shared resource is still lacking.

In the polar bear case, the existing sophisticated cross-scale approach effectively leaves out indigenous voices. Hence, the issue is how to insert Aboriginal co-management and build on the strengths of the mechanisms set up under the 1973 international agreement. In the wswg case, the drivers or mechanisms appear more *ad hoc* than the others. The links between Aboriginal and government agencies exist in each of the cases. But additional efforts are probably needed to improve two-way communication throughout the network of linkages, especially with respect to communication to and from the communities.

REFERENCES

- Agrawal, A., and C. Gibson. 1999. "Community and conservation: Beyond enchantment and disenchantment." *World Development* 27(4): 629–49.
- Anon. 2000. Beaufort Sea 2000 Conference. Renewable Resources for Our Children. Conference Summary Report. Fisheries Joint Management Committee, Inuvik. <http://www.fjmc.ca/publications/Beaufort%20Sea%20Conf.pdf> (August 2003)
- Bankes, N., 1998. "Steps towards the international regulation of POPs." *Northern Perspectives* 25(2): 18–21.
- Berkes, F. 2002. "Cross-scale institutional linkages for commons management: Perspectives from the bottom up." In *The Drama of the Commons*, edited by E. Ostrom, T. Dietz, N. Dolsak, P.C. Stern, S. Stonich and E.U. Weber, 293–321. National Academy Press, Washington DC.
- , and D. Jolly. 2001. "Adapting to climate change: social-ecological resilience in a Canadian western Arctic community." *Conservation Ecology* 5:18. <http://www.consecol.org/vol5/iss2/art18>
- , J. Colding, and C. Folke, eds. 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge, UK: Cambridge University Press.
- , J. Mathias, M. Kislalioglu, and H. Fast. 2001. "The Canadian Arctic and the Oceans Act: the development of participatory environmental research and management." *Ocean & Coastal Management* 44: 451–69.
- Brosius, P., A. Tsing and C. Zerner. 1998. "Representing communities: Histories and politics of community-based natural resource management." *Society and Natural Resources* 11: 157–68.
- Brower, C.D., A. Carpenter, M.L. Branigan, W. Calvert, T. Evans, A.S. Fischbach, J.A. Nagy, S. Schliebe, and I. Stirling. 2002. "The Polar Bear Management Agreement for the Southern Beaufort Sea: An evaluation of the first ten years of a unique conservation agreement." *Arctic* 55: 362–71
- Buccini, J., 2003. "The long and winding road to Stockholm: the view from the Chair." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 224–55. Montreal: McGill-Queen's University Press.
- Dewailly, E. and C. Furgal. 2003. "POPs, the environment and public health." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 3–21. Montreal: McGill-Queen's University Press.
- Derocher, A., G. Garner, N.J. Lunn, and Ø.Wiig, eds. 1998. Polar Bears. Occasional Paper of the IUCN Species Survival Commission (SSC) No. 19. IUCN, Gland, Switzerland.
- Downie, D., and T. Fenge, eds. 2003. *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*. Montreal: McGill-Queen's University Press.
- FJMC. 2001. *Beaufort Sea Beluga Management Plan*. Fisheries Joint Management Committee, Inuvik.
- Fast, H., J. Mathias, and O. Banias. 2001. "Directions toward marine conservation in Canada's Western Arctic." *Ocean & Coastal Management* 44: 183–205.
- Fenge, T., 2003. "POPs and Inuit: influencing the global agenda." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 192–213. Montreal: McGill-Queen's University Press.

- Fikkan, A., Osherenko, G., and Arikainen, A. 1993. "Polar Bears: the Importance of Simplicity." In *Polar Politics: Creating International Environmental Regimes*, edited by O. Young and G. Osherenko, 96–151. Utica, NY: Cornell University Press.
- Folke, C., S. Carpenter, T. Elmqvist et al. 2002. *Resilience for Sustainable Development: Building Adaptive Capacity in a World of Transformations*. International Council for Scientific Unions (ICSU), Rainbow Series No. 3. Paris. <http://www.sou.gov.se/mvb/pdf/resiliens.pdf> (August 2003).
- Gunderson, L.H., and C.S. Holling, eds. 2002. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press.
- Haas, P.M. 1992. "Introduction: epistemic communities and international policy coordination." *International Organization* 46: 1–35.
- Hay, K., D. Aglukark, D. Igutsaq, J. Ikkidluaq, and M. Mike. 2000. Final Report of the Inuit Bowhead Knowledge Study. Nunavut Wildlife Management Board, Iqaluit.
- Holling, C.S., ed. 1978. *Adaptive Environmental Assessment and Management*. New York: Wiley.
- Johnson, C. 2002. *Polar bear co-management in Alaska: co-operative management between the US Fish and Wildlife Service and the native hunters of Alaska for the conservation of polar bears*. In *Polar Bears*, edited by N.J. Lunn, S. Schliebe, and E. Born, 139–41. Occasional Paper of the IUCN Species Survival Commission No. 26, IUCN, Gland, Switzerland.
- Kendrick, A. 2000. "Community perceptions of the Beverly-Qamanirjuaq Caribou Management Board." *Canadian Journal of Native Studies* 20: 1–33.
- Lee, K. 1993. *Compass and Gyroscope*. Island Press, Washington, DC.
- Li, T. 2002. "Engaging simplifications: Community-based resource management, market processes and state agendas in upland Southeast Asia." *World Development* 30 (2): 265–83.
- Lunn, N.J., S. Schliebe, and E. Born, eds. 2002. *Polar Bears*. Occasional Paper of the IUCN Species Survival Commission No. 26, IUCN, Gland, Switzerland.
- McCay, B., and S. Jentoft. 1996. "From the bottom up: participatory issues in fisheries management." *Society and Natural Resources* 9: 237–50.
- . 1998. "Market or Community Failure? Critical Perspectives on Common Property Research." *Human Organization* 57: 21–29.
- Ostrom, E., T. Dietz, N. Dolsak, P.C. Stern, S. Stonich and E.U. Weber, eds. 2002. *The Drama of the Commons*. Washington, DC: National Academy Press.
- Pinkerton, E., ed. 1989. *Co-operative Management of Local Fisheries*. Vancouver: UBC Press.
- Prestrud, P., and I. Stirling. 1994. "The International Polar Bear Agreement and the current status of polar bear conservation." *Aquatic Mammals* 20: 113–24.
- Resilience Alliance 2004. <http://www.resalliance.org/programdescription/> (January 2004).
- Reiersen, L., S. Wilson, and V. Kimstach. 2003. "Circumpolar perspectives on persistent organic pollutants: the Arctic Monitoring and Assessment Programme." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 60–86. Montreal: McGill-Queen's University Press.
- Rodon, T. 1998. "Co-management and self-determination in Nunavut." *Polar Geography* 22(2): 119–35.
- Rothwell, D. 1996. *The Polar Regions and the Development of International Law*. Cambridge: Cambridge University Press.
- Ross, K. 2000. *Environmental Conflict in Alaska*. Boulder: University of Colorado Press.
- Selin, H. 2003. "Regional POPs policy: the UNECE CLRTAP POPs Protocol." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 111–32. Montreal: McGill-Queen's University Press.
- Shearer, R., and S. Han. 2003. "Canadian research and POPs: the Northern Contaminants Program." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 41–59. Montreal: McGill-Queen's University Press.
- Singleton, S. 1998. *Constructing Cooperation: the Evolution of Institutions of Co-Management*. Ann Arbor: University of Michigan Press.
- Watt-Cloutier, S. 2003. "The Inuit journey towards a POPs-free world." In *Northern Lights Against POPs: Combating Toxic Threats in the Arctic*, edited by D. Downie and T. Fenge, 256–67. Montreal: McGill-Queen's University Press.
- White, G. 2001. "And now for something completely northern: Institutions of governance in the Territorial North." *Journal of Canadian Studies* 35(4): 80–99.
- Wiig, Ø., E.W. Born, and G.W. Garner, eds. 1995. *Polar Bears*. Occasional Paper of the IUCN Species Survival Commission (SSC) No. 10, IUCN, Gland, Switzerland.
- Young, O. 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay and Scale*. Cambridge, MA: MIT Press.