Edited by Eugene Lee and Anthony Perl

The Integrity Gap: Canada's Environmental Policy and Institutions

UBCPress · Vancouver · Toronto 2003

6

Participatory Management and Sustainability: Evolving Policy and Practice in a Mountain Environment

Fikret Berkes, Jay Anderson, Colin Duffield, J.S. Gardner, A.J. Sinclair, and Greg Stevens

The case study described in this chapter, an interdisciplinary team project in southeastern British Columbia in a forested mountain environment, illustrates local and regional changes in sustainability planning in a multiple-use area. Change in local practice followed a major policy shift from a single-resource (logging) emphasis to multiple use. In the old management system, the forest industry used the forest with relatively little allowance for other uses. Under the new arrangement, the forest industry came under the control of an increasingly more stringent code, allowing for other uses and for the expression of environmental values in the form of more protected areas, conservation of major species, and biodiversity. This was accomplished through: (1) the incorporation of changing environmental values, (2) stakeholder participation in the normative planning stages, rather than post-decision involvement, and (3) ecosystem-based management in which resource users become participants in the process of monitoring ecosystem sustainability. This case illustrates the use of a diversity of information for sustainability planning, and the influence of rules and norms on policy making. It also shows, however, that a gap remains between policy and practice because of the inability to translate long-term participatory management into enduring policies at the various levels of decision making.

Introduction

Context

Sustainability can be examined from two different vantage points. Some of the chapters in this volume take a "macro" view, examining national-level policies and international agreements. Alternatively, one can take a "micro" view, looking at sustainability from the local level up. These two angles are complementary; they are part of a cross-scale approach to sustainability in which policies and practice may be examined across the scale of organization from the local level to the international (Berkes 2002). To understand

Canada's environmental successes and failures, we need to examine international forces as well as national and provincial policy. The cross-scale approach suggests, however, that we also have to know something about how environment and resource policies play out "on the ground" locally and regionally. In particular, we need to examine the dynamics of change and the evolution of policy and practice in response to various forces. This chapter takes a cross-scale view from the bottom up, and uses one detailed example, the examination of sustainability in a forested mountain ecosystem in British Columbia, to illustrate the application and evolution of science and policy from the local and regional to the provincial level.

The case study is offered not as an isolated story but as an example of the ambitious goals and some promising instruments that are being put into place for the conservation and management of the Canadian environment. Other case studies, corresponding to the various chapters of Agenda 21, could have been used just as easily to illustrate many of the same forces and processes. For example, a great deal of work is being done to implement biodiversity conservation (Chapter 15 of Agenda 21 [1992 Earth Summit]). Regarding indigenous peoples (Chapter 26), a number of land claims agreements have been signed between Aboriginal groups and the government since the Rio de Janeiro Earth Summit in 1992, including the Nunavut Land Claims Agreement of 1993 that changed the map of Canada by establishing a new northern territory. In the area of forest management (Chapter 11), the Canadian Model Forest network was created, with each model forest serving as a demonstration of partnerships to achieve sustainable forest management. Ocean protection (Chapter 17) is being addressed by the 1997 Oceans Act, which brings a new order and calls for ecosystem management and participatory approaches (Hanson 1998).

These changes in Canadian environmental management reflect a new dynamic of responses to the challenges posed by sustainable development and Agenda 21. A key characteristic of this new mode of environmental management is a widening of the policy network associated with ecosystem management (Coleman and Perl 1999). Can such initiatives for deliberation and action overcome the constraints and deadlocks that typify so much of Canada's previous environmental policy making? Or are there institutionalized constraints on the government's ability to deliver upon stated goals?

As the case study of British Columbia's approach to forest resource management will demonstrate, expanded policy networks have the potential to take into account a range of values that were previously ignored. They have the potential to create a kind of participatory science that supplements conventional scientific assessments done by government and industry. Such participatory management offers an institutional alternative to business as usual in Canadian environmental policy making that can contribute to the reduction of the integrity gap that has been noted throughout this volume. Institutionalizing participatory management requires moving beyond regional experiments, however, and creating the space to translate local alternative management approaches across the political scale into provincial and federal policy.

The Case Study

Research that supports sustainable development initiatives requires a broad approach, taking into account social, ecological, and economic factors. We started the British Columbia project with a special interest in the management of forested mountain environments, and in the use of participatory or people-oriented approaches to resource management. We adopted a view of sustainable development that explicitly included three elements:

- the environmental imperative of living within ecological means
- the economic imperative of meeting basic material needs
- the social imperative of meeting basic human and cultural needs.

Such an approach to sustainable development is concerned with much more than maximizing resource yields. It covers a broad range of environmental values as well as economic and social needs, and opens up the scope of decision making not only to a wider range of natural and social sciences but also to a range of stakeholders' interests affected by resource management decisions.

Under the overall goal of studying policy development with regard to the sustainable use of forested mountain ecosystems, case studies were developed in the Indian Himalayas and the Canadian Rockies. The objectives of the project were to develop integrated methodologies best suited for the comparative study of land resource management policies in forested mountain ecosystems; to study the successes and failures of mountain environment resource management policies and their social, economic, and historical context; to evaluate and develop criteria for assessing and monitoring sustainability in mountain environments; and to communicate policy implications to agencies and people concerned with sustainable development (Berkes and Gardner 1997). Parts of the study dealing with India (Berkes et al. 1998; Sinclair and Ham 2000; Sinclair and Diduck 2000) and with India-Canada comparisons (Duffield et al. 1998; Berkes et al. 2000) have been published elsewhere. This chapter is based on aspects of the Canadian case.

Following the introductory sections, the chapter has three major parts:

- the biophysical study, in which we sought to measure sustainability quantitatively, based on various databases

- the social study, in which we sought to assess sustainability qualitatively, based on indicators that were considered important by the people who lived there and used or managed resources of the area
- an analysis of the implications of our findings for improving the integrity of Canada's sustainability planning.

Concepts and Definitions

The sustainable development concept has been used widely as an organizing framework since the World Conservation Strategy (IUCN/UNEP/WWF 1980), the Brundtland report (WCED 1987), and the United Nations Conference on Environment and Development (UNCED), or Earth Summit, in Rio de Janeiro in 1992. The idea of sustainable development, as promoted in the World Conservation Strategy, referred to a broad range of objectives for meeting basic human needs while maintaining essential ecological processes and life-support systems, preserving genetic diversity, and ensuring sustainable utilization of species and ecosystems. The popularization of the term came with the World Commission on Environment and Development. Its report was long on problem descriptions and short on policy prescriptions, but it provided the standard definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their needs" (WCED 1987, 8).

The classical idea of sustained yields in resource management science goes back to a German forest scientist, Faustmann, who used the concept in 1849 to calculate the forest rotation period to maximize yields (Ludwig 1993). Applications of the sustained yield concept have been developed in fisheries, wildlife and rangeland management, and forestry, often with elaborate mathematical models that treat the target resource in isolation from the rest of the ecosystem. Since about the 1930s, maximizing sustained yields has been the goal in all areas of resource management. It was not until the 1970s that the concept first came under criticism from an ecological point of view, and, somewhat later, from the economic and social points of view.

The two kinds of sustainability are in sharp contrast. The maximum sustainable yield idea focuses on the resource as a commodity, with a prescription of the ways in which it can be efficiently extracted. By contrast, the second kind of sustainability – sustainable development – explicitly includes: (1) the environmental imperative of living within ecological means, (2) the economic imperative of meeting basic material needs, and (3) the social imperative of meeting basic social needs and cultural sustainability.

Thus, sustainable development is concerned with much more than maximizing resource yields. It covers a broad range of environmental values as well as economic and social needs, and opens up the scope of decision making not only to a wider range of natural and social sciences but also to a much wider range of stakeholders' interests affected by resource management decisions. A powerful but often ambiguous paradigm, sustainable development (SD) has been criticized for meaning all things to all people, and the institutionalization of SD has been interpreted as indicating a convergence of environmental and liberal norms (Bernstein 2001). Some authors have pointed out that it is more useful to consider SD not as a product but a process that does not have to be defined precisely in order to be useful. "Sustainable development is not a goal, not a condition likely to be attained on earth as we know it. Rather, it is more like freedom or justice, a direction in which we strive" (Lee 1993).

The Study Area

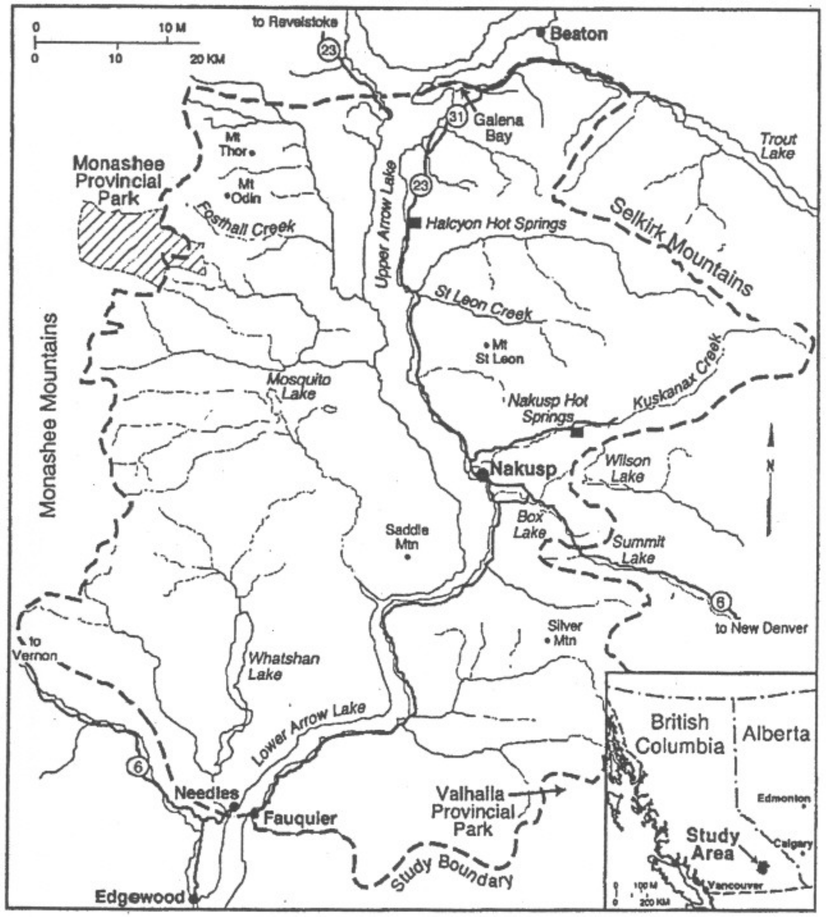
The study was carried out in the mountains of British Columbia along the Columbia River valley near the community of Nakusp (Figure 6.1). The Columbia River flows from north to south, widening to form the Upper and Lower Arrow Lakes. Water released from a series of dams built in the 1970s inundates the flatter parts of the river bottom and increases the size and depth of the Arrow Lakes. The dams were built for flood control and hydroelectric production, and the project was accompanied by considerable controversy at the time. Many families were forced from fertile valley bottomland as farms and towns were flooded. The area is sparsely settled; the town of Nakusp is the only sizeable community. It lies at the junction of the two roads that provide year-round access along the valley. In addition, there is an extensive network of resource roads (primarily logging roads) that allow vehicles ready access to all but the remotest parts of the watershed.

The diversity of the socio-economic history of the region reflects that of the mountain environment in which it is situated. Although no longer living there today, First Nations used the area before colonization, but were reduced by epidemics from the south in the mid-1800s. The Ktunaxa/Kinbasket, the Shuswap and the Okanagan nations have overlapping land claims in the region (CORE 1995). Towards the end of the 1800s, there existed a mixed frontier economy in the area, based on silver and gold mining and timber extraction. The wood was used for railway ties, construction, boat building, fuel, telephone poles, and shingles. Some forests were burned to facilitate prospecting. During the early 1900s, the region was known for its orchards, but competition from the Okanagan and high transportation costs reduced production to a local scale. Hard times began in the mid-1900s, triggered by the collapse of the silver industry and high costs of transportation. This change in the local economy was compounded by hydroelectric development and the impacts of reservoir creation.

Despite local protests, the Columbia River Treaty was signed in 1964 and the Arrow Lakes were raised into reservoirs with the completion of Keenleyside Dam in 1969. Flooded private land was bought or expropriated, and the arrival of hydro workers brought a temporary economic boom

Figure 6.1

The study area, Nakusp, British Columbia



that faded by the early 1970s. In recent years, tourism has become a growth industry, and the population is beginning to increase as low land prices attract migrants from Vancouver, the Okanagan valley, and Calgary. Logging is still the backbone of employment in the area, however (Stevens 1997).

Starting in the 1960s, commercial forestry emerged as the major force in the region's economy. Tree Farm Licences (TFLs) and Forest Licences (FLs) were created to give security of timber access to large companies with pulp and lumber processing operations. Forest Licences are located in Timber Supply Areas (TSAs). Major companies in the region include Celgar, Slocan, and Pope and Talbot. Much of the actual timber cutting is done by independent local contractors. Regionally, the industry is stable with increasing employment, but in Nakusp it is more volatile and employment is declining. Forest harvest volumes, practices, and land-use planning are currently in a state of flux as a result of the provincial Forest Practices Code (FPC) and the Timber Supply Review (TSR). These changes were the subject of a government-led study involving all the major stakeholder groups (Figure 6.2), called the Commission on Resources and the Environment (CORE 1995).

The attraction of the area is the high quality of life and relatively low cost of land. The scenic wilderness beauty, hot springs, relaxed lifestyle, summer recreational opportunities, wildlife viewing, and heli-skiing draw a variety of tourists. The forest environment supports wilderness opportunities and provides local income from nontimber forest products such as mushrooms. In the 1990s, immigration and tourism spawned a regional increase in employment in the service, construction, trade, finance, and government sectors. The economic impacts of immigration and tourism are appreciated as an increasingly important component of local livelihoods (Stevens 1997). Current economic activities in the region, which are based on forestry, services, tourism, silviculture, construction, and mushroom gathering are summarized in Figure 6.3. The figure depicts the relationships between the environment, resource management activities, services, and livelihoods. The interactions of forestry, other resources, and socio-economic activities illustrate why timber extraction needs to be balanced with alternative forest uses for a more sustainable regional economy.

Study Methods

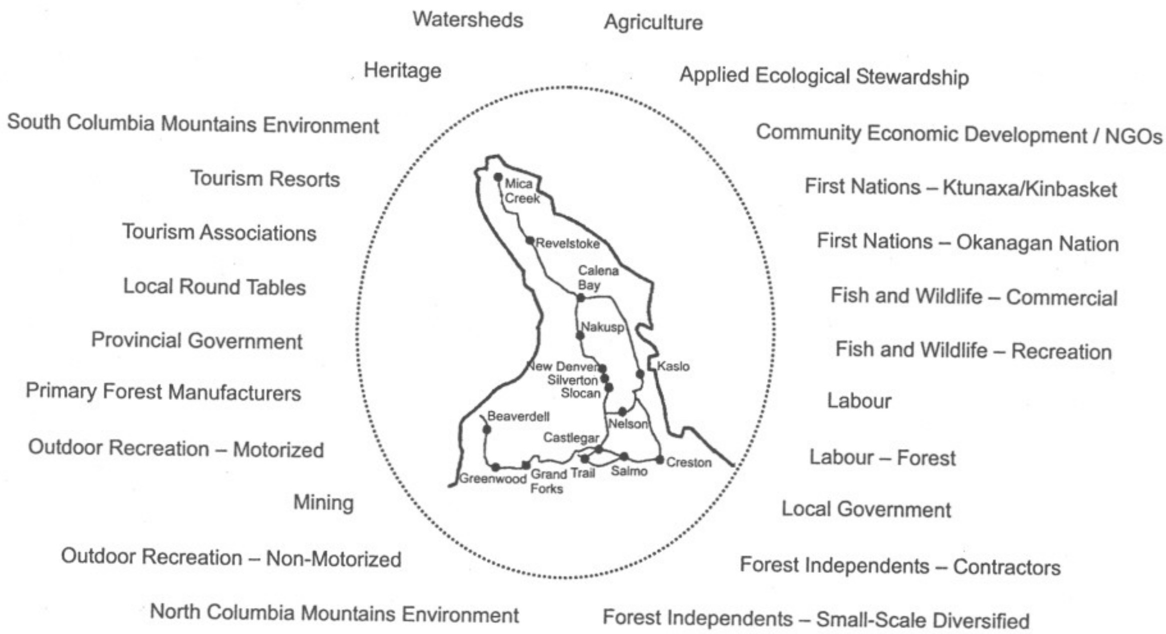
The Biophysical Study

A number of databases were assembled, and interviews with resource technicians, managers, and local users were conducted. Much of the discussion centred on interpretation of the databases, and management responses to environmental problems. Site visits were made to view forest harvesting operations, fish hatcheries, and dam sites, and a broad exploration of the local topography, economic activity, history, hazards, and land use was conducted. Some informal ground verification of satellite imagery was attempted, although most of the usable information was obtained from Geographic Information Systems (GIS) databases. Local contacts were a valuable source of information, identifying regional environmental concerns and providing leads to additional databases.

A Landsat 3 band Multispectral Scanner (MSS) image of the Columbia River valley, and two sets of air photos, one dating from 1970 and the other from 1987, were purchased, along with a selection of thematic and topographic maps. Eventually, an extensive and eclectic database was assembled from a variety of private, commercial, professional, federal, and provincial

Figure 6.2

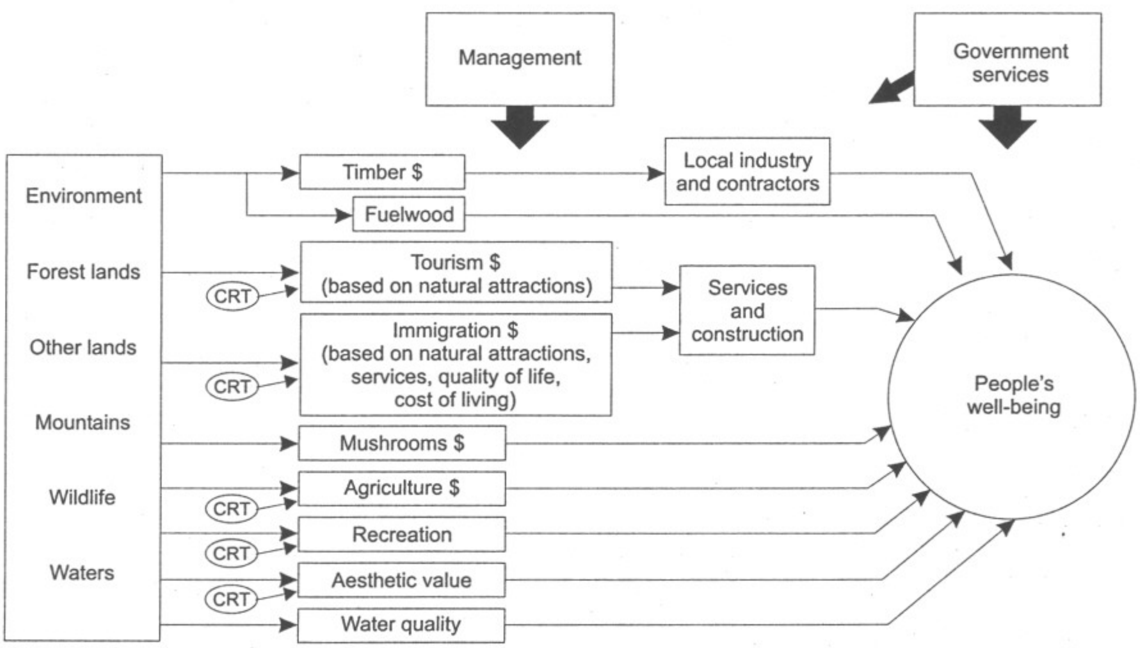
Composition of the West Kootenay–Boundary regional negotiation table



Source: CORE 1995.

Figure 6.3

A model of livelihoods in the Arrow Lakes region, showing relationships between the environment, resource management, socio-economic activity, services, and people's well-being



Source: Duffield 1997.

Table 6.1

Databases and data sources used for the study

Database	Comments and details
Satellite image	Landsat 3 band MSS image, 25 June 1992
Air photos	High-altitude coverage from 1970 and 1987
Hydrological data	Hydat CD-ROM dataset, Environment Canada
Climatological data	Environment Canada (B. Fehr)
GIS land-use data	BC Ministry of Environment, Lands and Parks (MoELP)
Land-use data	Commission on Resources and the Environment (CORE) report and background (CD-ROM)
Forest insect disease data	Forestry Canada
Caribou habitat data	Canadian Heritage, Parks Canada
Trapping harvest data	MoELP, Nelson, BC
BC fur auction price data	North American Fur Auctions, Winnipeg
Bull trout catch data	Glen Olson, Olson's Marine, Nakusp, BC
Kokanee catch data	MoELP, Grant Thorp, Senior Fishery Technician
Kokanee population data	MoELP, S. Sebastian
Arrow Lakes water quality	BC Hydro
Sewage discharge data	Environment Canada, Conservation and Protection
Air quality data	MoELP, Nelson, BC

Source: Adapted from Anderson 1997.

sources. We found twenty-one databases or data sets relevant to the study. Several of the data sets were redundant, however, as owners shared information with others. The most useful sixteen data sets were selected for study (Table 6.1).

The Social Study

To develop local indicators of sustainability, interviews were conducted with two groups. One group consisted of twenty-one natural resource management professionals in the Arrow Lakes region from Revelstoke, Nakusp, New Denver, Castlegar, and Nelson. The other group included twenty-two Nakusp stakeholders (local resident resource users and interest group representatives from Nakusp) drawn from the list of participants involved in the CORE (1995) process or related to it.

The interviews used a nonscheduled, structured technique based on four underlying questions. The questions evolved during the first few interviews, and the interviews themselves were highly flexible in style and pace depending on the person interviewed. Interviews ranged from half an hour to over two hours. The first three questions sought to elicit open dialogue and understanding of the major issues of concern, individual perspectives, and positives and negatives of living in the region. The last question targeted SD indicators by asking about signs and signals (and tell-tale signs and signposts) of SD. The aim was to encourage an easy flow of conversation. The interviews began with a brief introduction to sustainable development as something containing social, cultural, economic, and environmental dimensions. The four questions underlying the nonscheduled, structured interviews were as follows:

1 What are the issues, problems, and challenges concerning natural resources and the people in your area?
2 What drew you here; what do you like about living here; how do you make use of local natural resources?
3 How is your work linked to, or based on, natural resources? What natural resources?
4 What tell-tale signposts, signs, or signals come to mind that foretell a good or bad future for the people of this area, for the natural resources surrounding this area?

The Biophysical Study

Forests and Land Use

Two major provincial forest concessions make up the bulk of the study area: the Arrow Timber Supply Area (Arrow TSA) and Tree Farm Licence 23 (TFL 23). The TSA is a volume-based measure of tenure and is area-based. TFL 23 is leased by Pope and Talbot Limited. Much of the timber gathered from TFL 23 is processed at their sawmill in Castlegar. The Arrow TSA is divided among a number of harvesters, but the largest user is the Slocan Forest Company.

As summarized by Anderson (1997), the Arrow TSA has a total land base of 754,000 hectares, of which 201,000 hectares comprise the timber-harvesting land base. TFL 23 consists of an area of 555,000 hectares, of which 371,000 hectares are productive forest. The two are not distinct entities, as some of TFL 23 is included in the Arrow TSA. These two forestry administrations make up about 80 percent of the study area (the balance is in the Revelstoke TSA), although the study area itself comprises only about 21 percent of the land occupied by the TSA and the TFL together. The land base that is not part of the "productive forest" is made up of environmentally sensitive areas, private land, roads, steep slopes with unstable soils, inoperable land, unmerchantable timber, and other similar restrictions.

Forests in the study area are composed of stands of varying species and age. Within the Arrow TSA, Douglas-fir comprises 26 percent of the total; balsam, 24 percent; pine, 18 percent; and larch, 14 percent. Hemlock, spruce, cedar, and deciduous trees make up the balance. The study area is located within the interior wet belt, and includes the Interior Cedar-Hemlock (ICH) and Engelmann Spruce–Subalpine Fir (ESSF) biogeoclimatic zones. The ICH is found on lower slopes, while the ESSF is at higher and colder elevations. At the highest levels, the Alpine Tundra (AT) biogeoclimatic zone dominates.

At the heart of the issue of sustainable development in the forest industry is the size of the allowable annual cut (AAC), which is the government-permitted rate of timber harvest from a particular parcel of land. The focus of the calculation of the AAC is economic: the maximum number of trees that can be cut in a year and still guarantee a supply for industry in the future. It is a relatively short-term measure. Adjustments for other components of the forest ecosystem are a significant part of the calculation, but little or no attempt is made to examine the sustainability of these components in themselves. Instead, it is hoped that the forest set aside for nonharvest uses will be large enough to ensure their viability through the millennia.

Critical Sustainability Factors in the AAC

Approximately one-third of the study area consists of *watershed and visually sensitive areas*. In order to harvest these areas, cutting plans that are acceptable to the public must be developed. Local opposition to cutting of any kind often drags out the planning phase beyond ten to fifteen years. Only about 60 percent of the affected area has had a cutting plan accepted. This has the effect of deferring present harvests twenty to forty years into the future. In the modelling of the Arrow TSA allowable cut, riparian habitat protection zones were not subtracted from the land base since necessary information was not available at the time. This factor alone is estimated to reduce the harvesting land base by 2 to 4 percent.

With the increasing attraction of the Columbia River valley for retirement as the Canadian population ages and the Okanagan valley becomes crowded, pressures to refuse logging under any circumstances are bound to increase. Retirees and those not dependent on the forestry industry have no particular incentive to view logging as an acceptable alteration of the environment. Visual-quality restrictions are likely to increase, even in remote areas, as an increasingly mobile population seeks to visit "wilderness" areas. Environmental concerns and the social mood are likely to place significant demands on the forestry industry in the foreseeable future.

Minimum harvest age is an estimate of the time required for a stand to reach a merchantable condition. This factor is subject to market forces, silviculture, and technology, along with some uncertainty about actual growth rates of regenerating timber. Since it is subject to manipulation by technology, it is not unreasonable to assume that an earlier harvest age may be viable in future years. Stand volume estimates depend on surveys of the forest conducted over many years, generally assimilated into a GIS database. The accuracy of many of these surveys is questionable; Ministry of Forests officials suggested several times during our visits that the database held by Pope and Talbot was more reliable than that held by the government and on which the modelling was based. Arrow Forest Service staff have noted that the oldest forests in the region (20 percent of the land base) have many trees that are decayed and unmerchantable, and that actual timber volumes may be as much as 15 percent lower than assumed. In addition, much of the current harvest comes from younger trees, not the older ones that were assumed in the model, so that more area must be harvested to realize the same timber volume.

In all management areas, stands adjacent to recent cutovers cannot be harvested until a *"green-up" height* of three metres is attained by the regrowing forest, in order to provide habitat for wildlife. Due to brush competition, this green-up is often slower than assumed in the models. A companion issue is the *cut block adjacency rules*, which permit only 25 percent of an area to be cut at one time. Subsequent cutting cannot occur until green-up of the previous cut, a process that requires at least seventeen years. Most areas will thus require at least four passes spread out over nearly seven decades in order to remove all of the available timber. In actual practice, however, it is often impossible to cut the forest in 25 percent chunks, and often five or even six passes are needed to remove the timber.

The AAC calculations are extremely sensitive to adjacency rules and moderately sensitive to green-up rates. Taken separately, harvesting is already unsustainable with a six-pass restraint, and in need of reduction before the turn of the century with a five-pass restriction. If longer green-up times are needed, reductions to the long-term sustainable level will be required within twenty years. On the environmental front, ecological factors that impact the determination of the allowable cut and that were not included in the Arrow TSA analysis include land reserved for riparian habitat, old-growth requirements for caribou, cutting restrictions to accommodate use by wildlife, and the requirement that large pieces of woody debris be left for habitat on cutover sites.

Study of the GIS database obtained from the BC Ministry of Environment, Lands and Parks shows that less than 5 percent of the forest is 250 years or older within the study area. This is surprising because much of the land has been untouched by human hands, and has the general appearance of old-growth forest. The largest block of 250-year-old trees lies on the hills above Kuskanax Creek, on the north side. In fact, two-thirds of the timber harvest land base in the TSA is composed of immature trees between 80 and 120 years old, mostly as a result of forest fires that occurred in the late 1800s. Some of these fires were set by miners in the Slocan Lake area to expose the surface geology in their search for silver and lead deposits. In TFL 23, there is a moderate-sized component of the forest that has an age of 200 to 230 years, but the bulk of the licence area contains trees younger than 120 years.

As summarized by Anderson (1997), the forest industry in the study area and beyond is undergoing a series of changes brought on by several government initiatives, including the Forest Practices Code, the Protected Areas Strategy, and the CORE land-use proceedings. These programs are introducing a much stronger bias towards sustainable multiple use of the land and resource base. Declining employment in the forest industry, a renewed emphasis on tourism, and changing demographics have made local communities more receptive to alternative employment. In spite of these changes, substantial questions regarding economic sustainability remain. Many of these revolve around the assumptions used in the calculation of the annual allowable cut and the suitability of limits and obligations imposed by the Forest Practices Code. Overlying these concerns is the fundamental contradiction between viewing the forest as a wood-fibre farm rather than a matrix of a diversity of human users and natural values.

The question of harvest sustainability is sensitive to many factors. These factors are subject to many pressures for change, given the current social, political, and environmental climate, and the effects of the FPC, the CORE land-use recommendations, and a number of other government initiatives.

Wildlife

British Columbia has an impressive number of wildlife species, in large part because of the varied topography, climate, and biogeoclimatic zones that the province has to offer. The study area is not so well endowed, being restricted to species that prefer alpine and steep forested slopes. The loss of bottomland due to flooding has removed an area of high biological productivity and rich biodiversity from the region, probably resulting in the loss of some species from the area (such as the burrowing owl) and the migration of others to new habitats. The presence of human hands in this relatively uninhabited part of the central mountains has placed a number of other species in endangered or threatened status.

British Columbia assigns species and subspecies to "red" or "blue" lists that designate the level of threat to their continued survival in the province. Red-listed species are candidates for legal designation as threatened or endangered; blue lists are for sensitive or vulnerable species. Within the Central Columbia Mountain (CCM) ecosection, there are three red-listed species and twenty-two blue-listed species. Seventeen of the threatened species are birds. Not all of the species are found in the Arrow Lakes study area, as it encompasses only the western third of the CCM ecosection. Within the study area, the most prominent species are the mountain caribou *(Rangifer tarandus montanus)* and the grizzly bear *(Ursus arctos)*, both of which are blue-listed.

Mountain caribou are found mostly within the Southern Interior Mountains, numbering some 1,700 animals in all. Within the study area, they are found at higher altitudes on the east side of the Arrow Lakes, on the slopes of the Selkirk Mountains. They are a poorly studied population, and there is considerable uncertainty about their range and preferred habitats. Caribou are designated an "old-growth-dependent species" because much of their winter grazing depends on arboreal lichens that are most commonly found in the oldest forests, those greater than 250 years of age. Census information on mountain caribou in the Nakusp area is limited to a single study done in March 1994. This aerial survey showed significant caribou populations on the heights along Kuskanax and Gardner creeks in bands of 4 to 19 individuals. A total of 59 animals were sighted near the creeks, and a further 32 were found north of Halfway Creek. Animals in other locations nearby brought the one-day total to 131 sightings. Thirteen of the individuals sighted were calves, implying a healthy population.

A 1993 study of caribou habitat use in the Revelstoke area noted the variability in the use of the landscape by woodland caribou. During the late winter and summer, caribou tend to be found at higher altitudes; in the spring and early fall, they descend to lower slopes, although the spring descent appears to be relatively brief. Caribou preference for older forests is strongly expressed: forest age-classes 8 and 9 were selected by caribou on 80 to 95 percent of surveys throughout the seasons. Only springtime shows some slight tendency towards younger forests. In winter, caribou fed most often (46 percent) on the shrub falsebox *(Paxystima myrsinites)*. Forty percent of the diet consisted of old-growth lichens, and the balance consisted of food obtained by digging through the snow cover.

Caribou utilize old-growth forests over a large range. Home ranges from 169 to 215 square kilometres were calculated for the Revelstoke bands, with most movement occurring in spring. Preserving the habitat of the woodland caribou will have dramatic consequences for the forestry industry because the animal has a critical reliance on older forests, a wide distribution range from high to low elevations, small populations, a general intolerance of disturbance, and low fecundity. Clear-cut harvesting of mature forests is known to be incompatible with maintaining winter habitat for caribou (McLellan et al. 1994). As well, caribou are threatened by hunting and by fragmentation of populations by forest operations. Networks of roads that develop during forest harvesting operations allow snowmobiles into the alpine environments of the Selkirk Mountains during winter.

Grizzly bears are referred to as a "flagship species" because of their charismatic appeal to the public and as an "umbrella species" because of their wide-ranging habitat requirements, which, if protected, would provide living space for many other species. Grizzly bear populations in the Nakusp study area appear to be relatively stable, but other nearby areas, and North

America in general, have suffered extensive losses in the past century. Bears and their habitat are under considerable pressure from the human presence along the Arrow Lakes. And while increased access to wild areas, human–bear conflicts, and poaching threaten long-term survival, there are powerful environmental groups that have gathered to protect the bear's environment.

Grizzly bears are also highly mobile, varying habitat selection by season. Because of their omnivorous nature, nearly all habitats can be exploited by the bears, but the most important include riparian zones, avalanche chutes, mixed conifer and deciduous forests, meadows, alpine pastures, and winter denning habitat. According to CORE (1995), most grizzly bears feed intensively on huckleberry species to build the annual fat reserves required for hibernation. Grizzlies are thus extremely dependent on the maintenance of vegetative stages that support this important forage. Use of forage areas is also subject to the availability of adjacent thermal and security forest cover. Forest cover also provides movement corridors, edge habitat, and support of understorey forage species.

Grizzly populations in the West Kootenays are believed to consist of between 700 and 1,000 individuals (CORE 1995), a significant population size. Within the Selkirk Mountains, the estimated density of bears is 1 per 127 square kilometres. Current forest silvicultural practices attempt to bypass the shrub succession stage in the regeneration of marketable forests, depriving the bear of important berry food sources (CORE 1995). The extensive logging road networks that develop as a result of forestry operations bring humans into direct contact with the bears, presenting several problems, including habitat loss, harassment, displacement, human–bear conflict, poaching, and biological impacts such as reduced fecundity and survival. On the other hand, clear-cutting opens areas of the forest that can provide additional valuable habitat for the grizzly bear.

Local residents who come into regular contact with grizzlies treat the bears as a dangerous nuisance. For the most part, depredations in this area consist of attacks on cattle that graze the lower forests of the Selkirks. The number of people affected is very small, but encounters with grizzlies are certainly not rare in this prime habitat. A different attitude is held by the members of a variety of environmental groups who live in some other communities in the Selkirks. The centre of the local environmental movement lies in the communities of Silverton and New Denver, less than an hour south of Nakusp.

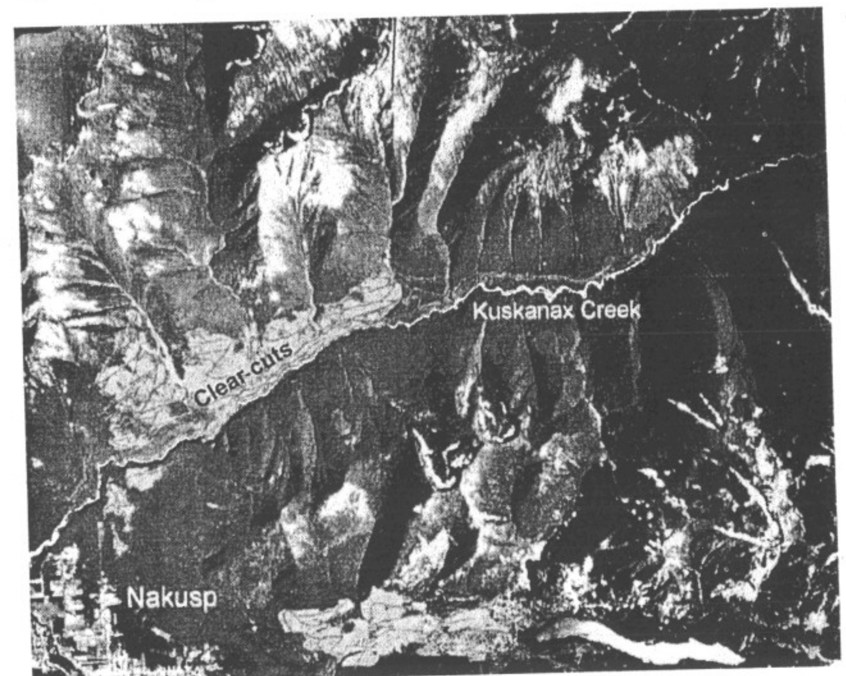
In summary, wildlife populations along the Arrow Lakes are subject to increasing stresses from human activities. Figures 6.4 and 6.5 illustrate how logging roads proceed into previously uncut areas and how cut blocks appear along the sides of these roads over a period of years. Logging has the most serious impact on caribou populations and will have to be managed carefully to preserve the Selkirk herds in a viable condition. The Forest Practices Code will go some way towards providing these limits, but CORE documents suggest that the long-term survival of the caribou is still quite uncertain. Mature cedar and hemlock forests must be protected because of their heavy use in winter, especially those above Kuskanax Creek. Caribou in the Arrow Lakes area spend more time at low elevations than those elsewhere in the province, and the potential for conflict with the timber industry is very high. Grizzly habitat can most easily be protected by reducing contact between humans and bears. Much of this contact has been facilitated by the ready access to remote backcountry through the extensive network of logging roads. While many of these roads must now be rehabilitated according to the FPC, removing older roads will prove much more difficult.

Water Quantity and Lake Levels

Five hydrometric stations are located within the study boundaries; three were analyzed in detail for the purposes of this project. The issue of most concern to the local population was the extreme variation in water levels in

Figure 6.4

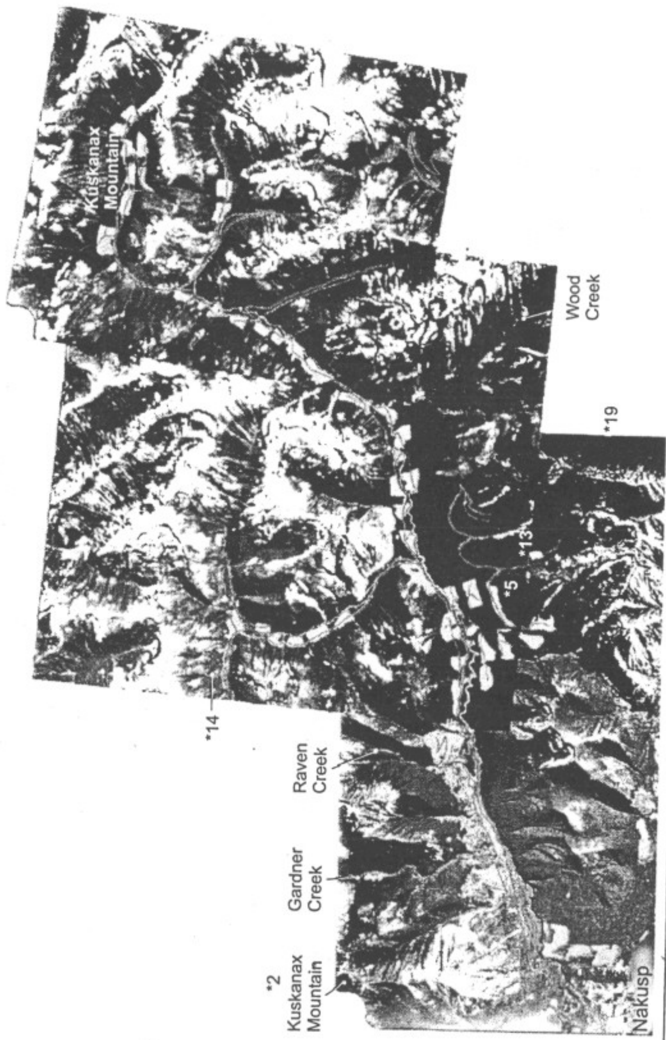
High-altitude air photo of the lower Kuskanax Creek, August 1970



Source: Anderson 1997.

Figure 6.5

High-altitude air photo of the length of the Kuskanax Creek, July 1987



Notes: A string of clear-cuts extends almost the entire length of the Creek, and the roads leading off to new cutting areas. Asterisks (*) mark the locations of caribou sightings during a reconnaissance flight in 1994. Numbers beside the asterisks indicate the number of animals sighted.
Source: Anderson 1997.

the Upper and Lower Arrow Lakes from its management as a storage reservoir for downstream hydro dams. For the most part, this concern centred on aesthetic qualities, particularly within the town of Nakusp and at cottage sites along the nearby shoreline. During June, the level was at its seasonal low, revealing mud flats and sandbars along the shoreline of the town of Nakusp. Later, water levels had risen to a midsummer high, a rise on the order of ten metres. To study water quantity, two watersheds, Kuskanax Creek and Barnes Creek, were analyzed during the project using the Hydat database compiled by Environment Canada. No sediment measurements are available for these creeks, only streamflows. Sediment measurements would have been more useful, as the transport of particulate matter responds more directly to changes in the watershed and impacts fish populations more directly.

The Kuskanax Creek rises in the Selkirk Mountains northeast of Nakusp and flows southwestward to enter Upper Arrow Lake just above the town. The stream drops 1,490 metres within its 45-kilometre length. The watershed is relatively lightly logged, and settlement along the creek is dispersed and confined to the lowest 15 kilometres. Logging has been moving steadily back into the upper reaches of the watershed since 1970, and now extends along the major tributary as far as the headwaters. In general, only the area close to the stream bed is harvested. Narrow buffer strips protect all stream banks. The creek has two streamflow gauges, one 8 kilometres upstream from the mouth, and the other some 23 kilometres further along, 600 metres above the lake; both were analyzed for systematic changes in streamflow characteristics during the period of record that might reflect the influence of logging. Both sites showed a regular annual cycle dominated by snowmelt runoff in the spring, with spikes of higher streamflow resulting from significant precipitation events during the year. On average, runoff rises sharply in mid-April. Average streamflow peaks on 3 June and then declines slowly through the rest of the year.

The literature on watershed snowmelt suggests that removal of tree cover should result in a more rapid and higher peaked streamflow with a faster response to rising temperatures. Since snowmelt is highly related to temperature, the correlation between the two can be exploited to detect systematic changes that might be due to logging. This approach assumes that the correlation between streamflow and air temperature would rise as logging opened up more of the forest. Examination of the data did not show any statistically significant trend from 1964 to 1992. Correlation measures between temperature and streamflows also failed to show any significant trend. A similar analysis for the Barnes Creek, on the western side of the Columbia River valley, also did not show any statistically significant trend.

Changes in lake level are significant for sustainability. The Keenleyside Dam near Castlegar regulates lake levels for both the Upper and Lower Arrow

Lakes in response to demands for water from the state of Montana. Lake levels follow an annual pattern typical of temperate zone storage reservoirs – a gradual drawdown through the winter months to a minimum in early April, followed by a sharp rise to a peak in July. The average amplitude ranges from 425 to 438 metres above sea level with extremes at 420 and 441 metres. Before regulation, the Upper Arrow Lake varied between 417 and 429 metres. The original rise of the lake, present high-amplitude annual variation, and the slow winter discharge all have implications for sustainability. The original flooding destroyed a bottomland ecosystem of farms and forest, posing a considerable burden of human grief and displacing animals.

The single biggest loss to the Columbia River system is the disappearance of the Pacific salmon, due entirely to the construction of the Grand Coulee Dam in Washington state. The lake is now populated by kokanee, a landlocked, nonmigratory form of sockeye salmon, *O. nerka*. Since no data are available on fish populations before the dam construction began, only speculation remains to evaluate the effect on other fish species, bears, birds, and other consumers of the once-rich salmon resource. Discussion of the impact of damming and the annual wave of high and low water would not be complete without a discussion of the impact on human inhabitants. Emotions still rise when the subject of the original flooding and compensation is broached. Remaining members of the original families retain memories of farms long drowned, of graves hidden or moved, of a lifetime of work flooded. Compensation was meagre, often without substantial discussion. Still, many of the original families continue to inhabit the valley, with new jobs and roots.

In summary, two major watersheds along the Columbia River have been examined for streamflow changes that might result from an ongoing history of logging. No effects have been detected that deviate significantly from natural patterns. This does not completely eliminate the possibility that changes may have occurred in sediment loading and transport that are not reflected in streamflow trends, but the available evidence suggests that logging has had a relatively benign effect on the watercourses. Are the Arrow Lakes sustainable in the era of dams and fluctuating water levels? Apparently so, if a broad enough view is taken.

Fish

The Arrow Lakes contain a rich fishery, with kokanee salmon, bull trout *(Salvelinus confluentus)*, and rainbow trout (including the legendary Gerrard rainbow) attracting anglers from across North America. There is no commercial fishery. Local residents speak of readily available catches of bull trout, the most sought-after species, which are fished primarily in winter months, when the tourists have departed for home. Resource managers, however, talk of the fishery with a sense of unease, half-expecting a decline of fish populations in the coming years. The upstream dams have had a serious impact on the spawning grounds available for kokanee and bull trout, but the construction of a fish hatchery at Hill Creek, near the north end of the study area, has mitigated much of this loss. It would seem that concerns about the loss of kokanee are overstated, and current populations do not show a downward trend. Local fishermen give mixed opinions about kokanee populations, allowing at one moment that the fishery is "not good" and at the next moment that kokanee are "easy" in July and August. For the most part, they eschew kokanee and prefer bull trout.

Bull trout are another concern, with fisheries managers telling of significantly declining populations. Until 1995, bull trout could be fished freely, but catch limits were imposed for the 1996 season and beyond. Resource managers attribute most of the decline in the species to habitat destruction during logging operations and to overfishing. Local fishing opinion maintains that populations are healthy, but identifies increased effort and "knowing where to go" as important factors in fishing, a tacit admission of a decreasing catch per unit effort. Bull trout are particularly vulnerable to habitat loss in the tributaries of the Columbia River, as they occupy the steepest and highest parts of the stream courses.

In summary, fish populations are showing mixed responses to human development and presence along the Columbia River. While kokanee numbers are stable, in large part because of enhancement by the Hill Creek hatchery, bull trout numbers are declining from overharvesting and habitat loss. The Forest Practices Code (CORE 1995) requires riparian buffers that may go further than past practices in protecting spawning habitat. The jury is still out on the sustainability of fish populations, but no insurmountable barrier appears to have been reached besides the disappearance of migratory salmon species.

The Social Study

Signs and Signals of Sustainability

There are two approaches to measuring and quantifying sustainability. The biophysical part of this study examined sustainability using quantitative and objective data. This is only part of the story, however. Sustainability is also socially constructed – that is, people use their own values to make judgments about sustainability. We had previously explored the social dimension of sustainability by asking mountain villagers in the Himalayas about the indicators they thought were important for predicting a good future for themselves and their children. We repeated this approach in the British Columbia study (Duffield et al. 1998).

Results from the signs and signals question and content analysis of the first three questions were organized under the headings of environment, management, socio-economy, and healthy community. The signs and signals results were analyzed according to the two groups of respondents – Nakusp stakeholders and natural resources management professionals in the study region. To make the number of indicators more manageable, topics raised by one person that did not readily combine with other topics were not included. In several instances, combining signs and signals resulted in the "frequency sign/signal discussed" figure being greater than the number of people interviewed. For example, the Forest Practices Code and the Commission on Resources and the Environment were usually discussed together, probably because of their combined impact on forest and land-use management.

The most frequently mentioned sign or signal discussed by both groups was an "effectiveness of management process" indicator that considered forest and land-use rules and regulations, including the FPC and CORE. It is not surprising that the efficacy of forest and land-use management was given high priority as an indicator, since such management has the potential to safeguard sustainable development. Among professionals, only the forest and land-use management indicator stands above the rest in terms of frequency. In contrast, Nakusp stakeholders emphasized four additional signals above the rest: immigration linked to economic and commercial growth; health of the tourism industry; viability of the mushroom and other nontimber forest–based industries; and natural, aesthetic, wilderness attractions and recreational opportunities. The latter two signals were multiple-category indicators. Besides these top categories of signs and signals, several others were mentioned.

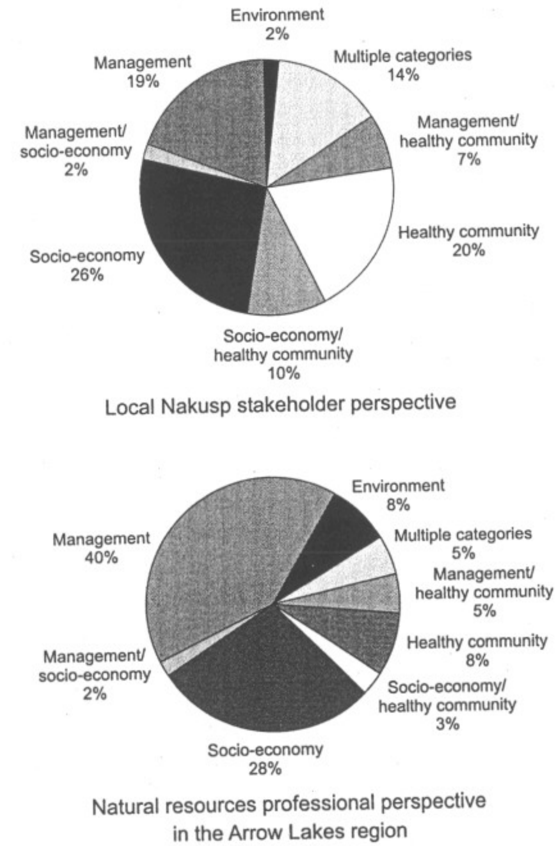
The additional indicators to monitor that were discussed by at least ten of the twenty-two Nakusp interviewees include: "youth opportunity" (embracing issues of education, credit, family planning, and role models); "community self-reliance" (ability of the community to meet its own needs for necessities and services); "local input and control" over management (an empowerment and management issue); ensuring that harvest is below the annual allowable cut (related to the Timber Supply Review); and quality of life.

The additional signs and signals to monitor that were discussed by at least ten of the twenty-one professional interviewees included: ecosystem-based management (a "mimic nature" approach used in land use and watershed restoration activities); ensuring that harvest is below the annual allowable cut; "wood utilization" (rules for harvest and processing exist and are improved); "land-cover pattern" (a key component of feedback for management); "local input and control" over management (critical to prevent future conflicts); "tourism industry health" (links to natural attractions and availability of services); "local value-added" (refers to adding value to locally extracted wood using local processing industries); "immigration linked to economic and commercial growth"; and "natural attractions."

The two pie charts in Figure 6.6 summarize and compare the frequency of indicators discussed by the two groups. The comparison is based on the percentage of signs and signals under headings of environment, management, socio-economy, healthy community and several mixed categories. The greatest differences between the two groups occur under headings of management (stakeholders, 19 percent; professionals, 40 percent) and healthy community (stakeholders, 20 percent; professionals, 8 percent).

Figure 6.6

Indicators of sustainability according to Nakusp area stakeholders and natural resource professionals



Source: Duffield 1997.

Different job backgrounds probably account for the variance. The job description of professionals includes management, application of process, rules and regulations, and understanding of the interactions between management and effects on the environment. Local stakeholders also have knowledge of management, but their experience is more broadly focused on life in the community where they live. The stakeholders come from a variety of job backgrounds, many of which have a social, community development focus. It thus comes as no surprise that healthy community indicators of opportunity for youth, quality of life, sense of community, people's adaptability, tolerance for others, alcohol abuse, family abuse, and water supply and sewage issues are given greater consideration by Nakusp stakeholders than by professionals.

Figure 6.6 suggests that professionals give more weighting to environmental monitoring as a feedback signal for management; again, this is probably a result of job background. In contrast, the two groups give nearly equal overall weighting to indicators under the socio-economy heading. However, the stakeholder perspective is heavily based on the two indicators of immigration linked to economic and commercial growth and health of the tourism industry, whereas professionals identified a wider array of socio-economic signs and signals. Under the double-category headings in Figure 6.6, stakeholders placed more emphasis on socio-economy/healthy community indicators (stakeholders, 10 percent; professionals, 3 percent). Such signs and signals include community self-reliance, access to services, entrepreneurial spirit, and local investment. Stakeholders also discussed a greater diversity and slightly greater number of management/healthy community indicators (stakeholders, 7 percent; professionals, 5 percent). Their signs and signals include local input and control, environmental and social activism, and the resource management education level of the public.

A large weighting discrepancy occurs in the two indicators under the multiple categories heading of Figure 6.6 (stakeholders, 14 percent; professionals, 5 percent). This heading includes mushroom and nontimber forest industry viability, and maintaining natural attractions in the region. The large difference may result partially from the fact that interviews were conducted at the height of mushroom-picking season. As well, given that stakeholders receive the direct and indirect benefits of mushroom harvest and natural attractions (the latter relates to tourism, immigration, and well-being), locals may have a greater awareness of the importance of mushrooming and natural attractions to sustainable development.

Developing Criteria for Sustainability

Through the use of various databases, the project was able to make an overall *quantitative* assessment of sustainability with respect to the biophysical dimension of sustainability. A similar approach could not be used for the economic and social dimensions of sustainability, however. Much less information was available on social and economic parameters. In a qualitative assessment of these parameters, CORE (1995) concludes that "economic and social indicators such as a reduction in resource industry jobs, lack of investor confidence, reduced community stability and conflicts among different resource users further emphasize a lack of sustainability, reflecting a general trend in Canadian resource-based communities."

Since part of the project objective was to involve the local people in resource management and sustainability assessment, we took the obvious but often-neglected step of *asking the local people* what sustainability meant to them. We asked a sample of local stakeholders for locally identified signs and signals that should be monitored in order to predict a good future, with the idea that these "signs and signals" may be considered as a proxy for sustainability indicators. For cross-verification, we asked the same question to a sample of natural resources management professionals working in the area. The responses were organized into five clusters: forest indicators; forest-linked indicators; forest management indicators; economic indicators; and social and community health indicators (Table 6.2).

Several conclusions can be drawn from the findings summarized in Figure 6.6 and Table 6.2. The first is that the two groups of respondents in the Arrow Lakes area had a great deal in common with each other, with about a two-thirds overlap in their responses. The managers placed more emphasis on management-related indicators and less emphasis on economic and social indicators than did the local population. Second, there was no single "key indicator," suggesting that meaningful indicators need to be context-specific. Indicators came in clusters, and the most robust cluster was the pervasiveness of good management, that is, using those indicators that provided feedback on management success. Third, both groups of respondents suggested signs and signals that covered the ecological, economic, and social aspects of sustainability.

Did this mean that the local people and the local managers knew their sustainable development theory, or did it mean that sustainable development theory is on the right track in terms of what local people and local management practitioners in fact recognize as important? The fact that our respondents in the Himalayas also provided sustainability indicators that covered ecological, economic, and social aspects suggests that the scientific concept of sustainability is consistent with the environmental understanding of people of mountain ecosystems (Duffield et al. 1998). In any case, our study demonstrated that *asking* the local people about sustainability generated sensible and meaningful indicators for a given area.

Implications for Sustainability Planning

The case study offers certain implications and insights regarding the integrity

Table 6.2

Categories of sustainability indicators based on interviews of local people and natural resources management professionals in forested mountain environments in Canada and India

Category	Indicators
Forest indicators	Quantity and quality of forest; amount of cover; tree species diversity; forest density; and availability of forest products. Few stakeholders mentioned old-growth forest. Several managers mentioned land-cover-related indicators: protection of riparian habitat, habitat fragmentation, biodiversity loss, and ecosystem health.
Forest-linked indicators	Avalanches and landslides; control of erosion; consistent water flow of streams, springs, and rivers; clean water; and consistent climate were mentioned by Himalayan villagers and managers but not by those of Nakusp. Nontimber forest products, water quality, and scenic beauty were mentioned.
Forest management indicators	Forest and land-use rules and regulations; harvest versus allowable cut; silvicultural success; ecosystem-based management; multiple-use. "Good management," using those indicators that provided feedback on the manager's ability to work for sustainability, was the most robust indicator.
Economic indicators	Economic growth and in-migration, as related to economic development. Both stakeholders and managers mentioned tourism, economic diversification, local value-added, road and rail access, and job creation per unit amount of wood harvested – all of them related to diversification and moving beyond a single-resource, extraction-based economy.
Social and community health indicators	Local input into decision making; youth opportunity, community self-reliance, quality of life, sense of community, and access to services. These were less frequently mentioned by managers, except decision-making input and quality of life.

Source: Adapted from Duffield et al. 1998.

of sustainability planning. We have concentrated so far on how provincial-level policy results in changes at the local and regional levels, even though there are implications at the national and international levels as well. In this section, we explore cross-scale implications of policy and practice more broadly. Changing resource and environmental policies may result in changing resource-use practice in three ways: the incorporation of new values and

priorities, public and stakeholder participation in decisions, and ecosystem-based management. We deal with each in turn, after an examination of the context of the case study and before returning to the question of integrity.

The Context: Changing Resource-Use Policies

The CORE (1995) initiative, on which the case study builds, was predicated on the idea that resource demands have increased in British Columbia and that social values have shifted towards greater environmental protection (M'Gonigle and Wickwire 1989). These shifts, apparent not only in British Columbia but also across Canada, required new resource management and decision-making processes that reflected the full range of public values. The CORE exercise had included the analysis of timber supply sustainability in the area of the case study, as well as the sustainability of a range of other products and values related to the mountain forest; it defined sustainability as "the assurance that present land use decisions do not compromise the opportunities available to future generations" (CORE 1995).

The study team arrived in the case study area at a time when the single-resource-use approach was being replaced by one adapted to address multiple resource demands. For about three decades, the area had been managed largely for one product: timber from the forest. The area had in fact a history of shifting single-resource focus, from mining to agriculture to hydroelectric development to timber. Historical photographs of the area document these various phases and the boom-and-bust economy that went with them. In Howlett's terminology (Chapter 3), such an economy may be referred to as a "staples political economy," and the changes documented in the case study mark the transition to a "post-staples economy."

The debate under the CORE process (1992-94) was how to replace the single-resource focus with a planning process that allowed for consideration of many resources and values: agriculture, mining, forestry, tourism, recreation, aesthetic and spiritual enjoyment, fish and wildlife conservation, watershed protection, and biological diversity. The overall verdict of CORE (1995) was that resource use and management in the West Kootenay region had *not* been sustainable. Timber supply reviews conducted by the British Columbia Ministry of Forests had indicated that harvest levels had to be reduced by as much as 50 percent in some areas to achieve sustainable timber yields. Anderson (1997) subsequently calculated for the study area (which is a small part of the region considered by CORE) that current annual harvests needed to be reduced by about one-third to stretch out the timber supply into the future, that is, for long-term sustainable harvests.

Population data for two key indicator species, woodland caribou and grizzly bear, suggested that their long-term survival in the study area may be threatened if current practices continue. Caribou are sensitive to the reduction of old-growth forest, and very little was left of the oldest two age-classes of forest. Figures 6.4 and 6.5, based on two sets of air photos from 1970 and 1987, show the pattern by which a previously uncut forest area is developed. Figure 6.5 shows that caribou sightings were made in uncut areas; in fact, the largest concentration was found in the largest block of old-growth timber (Anderson 1997). The grizzly bear, by contrast, is a habitat generalist not readily affected by forest cutting. It is affected, however, by the construction of logging roads that bring the bears into conflict with humans. Some other species of wildlife may also have been affected through loss of habitat quality as a result of extensive logging, since large clear-cuts reduce landscape diversity. Yet other species are attracted to newly cut areas that tend to be productive with berries and edible shrubs.

On the whole, CORE (1995) concluded that water quality in freshwater systems that are critical for fish habitat as well as for human consumption has shown continuous signs of deterioration. The study team's interpretation of the data indicates a decline in one valuable species of trout (bull trout), while the population of the dominant landlocked kokanee salmon has been sustainable. There was some evidence, based on resource managers' observations (in the absence of actual data), that clear-cutting in the tributary watersheds has caused siltation, affecting some fish spawning areas and water quality in general. The analysis of the hydrological data has not shown a significant impact of forest cutting on water yields, however.

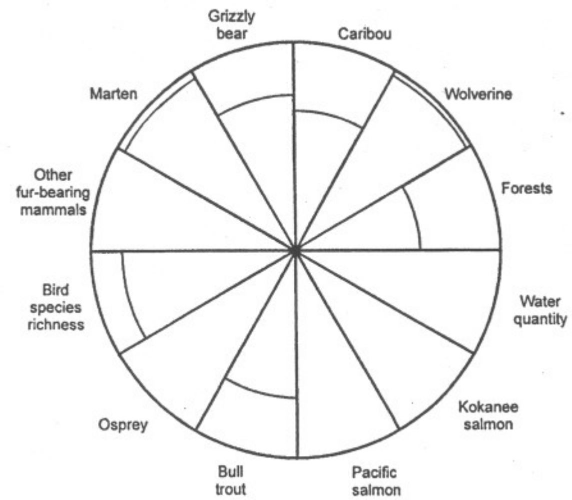
Figure 6.7 summarizes the available biophysical data to show those parameters that seem to be sustainable and those that are not (Anderson 1997). Note that the analysis is based on indicators for which quantitative data were available. Many parameters, such as the impact of forest cutting on water yields or erosion, cannot be shown because the data are ambiguous, insufficient, or nonexistent. The implications of our findings for new institutionalist approaches to policy development may be considered under three overlapping headings. The first concerns changing values and priorities in the use of forested mountain environments. The second involves improving public participation in management processes. The third involves the reconceptualization of ecosystem management to take account of people as an integral part of the system. Each of these will be considered in turn.

Changing Values and Priorities in Forest Use

The Arrow Lakes area is not an isolated case. A major change that has affected policy in recent years is a shift in social values towards greater environmental protection. Canada in general and British Columbia in particular have a history of rapid depletion of resources along a shifting resource frontier. The pattern of forest resource use has historically followed a sequence of exploitation from the more valuable to the less valuable species (Regier and Baskerville 1986). Under a resource management paradigm that emphasized commodification and economic growth, the decades-old "multiple-use

Figure 6.7

An OMOEBA diagram for the ecosystem of the Arrow Lakes study area



Notes: Resources that are used sustainably are represented by a sector that reaches the full radius of the circle. Resources that are not used sustainably have a sector length proportional to the degree of sustainability. The analysis is based on indicators for which quantitative data were available.
Source: Anderson 1997.

sustained-yield" approach guided the managers of public forests. An emerging forestry paradigm is challenging this traditional approach, however. Variously called forest ecosystem management, sustainable forestry, or multivalue forest management, the emerging approach establishes that the recognition of multiple values must be at the root of decision making in forest management. Bengston (1994) notes that this is resulting in the consideration of a whole series of new questions, such as: "What is the nature of forest values? Whose specific values are involved? How and why have forest values changed over time? What do changing forest values imply for ecosystem management?"

Resource users and managers in Canada are beginning to acknowledge the legitimacy of recognizing multiple values within the decision-making process. The CORE process in British Columbia attempted to bring stakeholders with varying forest values to the same discussion table. It achieved some success in motivating stakeholder participation in the process, and as a result, multiple-use and forest protection values were injected into the decision-making process. Other studies, including the Model Forest program, are underway in British Columbia and other Canadian provinces, to develop more detailed approaches and methodologies for identifying and incorporating a broader spectrum of values within the decision-making process, including, for example, nontimber forest products and Aboriginal values (Davidson-Hunt et al. 2001).

These competing values have yet to be reconciled, however. It is difficult to say that CORE and model forest experiments have been successfully "scaled up" into provincial- and federal-level policies to deal effectively with a reconciliation of values. As in other domains of Canadian environmental policy making, the identification and study of alternative values is not in itself sufficient to break the constraints of political institutions grounded in a utilitarian tradition.

Public Participation: Moving to Normative Planning

Central to a respect for forest values emerging from broader recognition of environmental values is the effective involvement of people within the policy-making process. Often called public participation or multi-stakeholder decision making, the focus in this process is on the diversity of people involved and the method of their involvement. In British Columbia, as elsewhere in Canada, public involvement in resource decision making usually occurs through legislated environmental assessment processes. Such processes are supposed to provide an opportunity for public participation. Since the environmental assessment process is project-driven, however, there is usually little opportunity for stakeholders to be involved in the normative planning stages. By this we mean a more inclusive mode of public participation, one that allows a broad range of participation *before* decisions are made.

The CORE process is an example of normative planning. It involved some twenty-four stakeholder groups on the round table (Figure 6.2). The CORE (2000) report explains that negotiation was used as a means of attempting to reach agreement among parties. Negotiation was carried out on the basis of *interests* rather than predetermined *positions*. This is in contrast to positional bargaining, in which parties often perceive themselves as opponents and bargain to achieve fixed all-or-nothing positions. Positional bargaining tends to result in win-lose outcomes in which one party gains at the expense of others, as one finds in environmental assessment hearings. In interest-based negotiation, by contrast, parties communicate their interests to one another and work towards win-win solutions that have a chance to provide a balance and accommodate many interests.

Using this approach, the CORE process attempted to involve stakeholders in normative planning about British Columbia forests *before* specific project decisions regarding allocation were made by forest managers. This is different from post-decision involvement, which characterizes Canadian environmental assessment in general (Sinclair and Diduck 1995). CORE was not, however, an unqualified success. Numerous questions were raised by stakeholders about the process of involvement used by CORE, and there were concerns about the voices *not* heard, such as those of two Aboriginal groups. Further, as noted earlier, the full results of the CORE process were not adopted by forest managers in making allocation decisions, which underscores the point about the integrity gap.

Ecosystem-Based Management: Putting Humans Back into the System

Some very significant changes have been occurring in many parts of the world in the way people-environment relationships are being conceptualized (Berkes and Folke 1998). A key development is the focus on ecosystem-based management. Such management does not focus primarily on *resources* but rather on the sustainability of ecosystem structure and function necessary to *provide* these resources. According to the Ecological Society of America, ecosystem management must include the following components:

- long-term sustainability as a fundamental value
- operational goals
- sound ecological understanding
- understanding of complexity and interconnectedness
- recognition of the dynamic nature of ecosystems
- attention to context and scale
- acknowledgement of humans as ecosystem components
- commitment to adaptability and accountability.

All of these measures, and ecosystem-based resource management in general, have policy implications (Ecological Society of America 1995).

Current views of ecosystem-based management acknowledge the role of human societies, not merely as despoilers of the environment but as integral components of the ecosystem who must be engaged to achieve sustainable management goals. Of particular interest are local *institutions* of resource management, such as common property institutions, that regulate the use of shared resources. Such institutions function as repositories of local ecological knowledge and play a role in complementing government science. This kind of participation in management by community-based institutions goes beyond mere public participation. People who are living in an ecosystem and making a livelihood from it tend to have an understanding of that ecosystem and thus a key role in its management (Berkes and Folke 1998).

In the case study area, there was little evidence of ecosystem-based management with people, and no evidence of the use of local commons institutions for sustainable management. Internationally, examples of local groups creating their own "citizen science" and participating in management include watershed management groups in Minnesota (Light 1999) and lake management groups in Sweden (Olsson and Folke 2001). "People's

Biodiversity Registers" in India is an ecosystem assessment project in which entire regional networks of biodiversity users have been created in the countryside. The participants are rural people who are knowledgeable about and who use biodiversity in the form of food species, animal fodder, medicinal plants, and other such uses (Gadgil et al. 2000).

In conclusion, the case study reveals the evolution of resource and environmental policies to address three aspects of sustainable development: changing values and priorities, public participation, and ecosystem-based management. There are clear initiatives emerging in each of these three areas that have a potential to transform environmental policy-making processes, not only in British Columbia's forests but also in a number of other resource areas in various parts of Canada. Through Aboriginal land claims, model forests, and other experiments, people on the ground are being linked with resource managers and policy makers in ways that enable more effective, efficient, and equitable modes of resource and environmental management. Ecosystem-based management has the potential to close the circle by putting people back into the ecosystem, by valuing local knowledge, and by creating a "people's science." Such a science questions the top-down, managerial, expert-knows-best approach. Rather, people who make their livelihoods from an ecosystem become partners in the management of that ecosystem.

We began this chapter by identifying the potential for widening the policy network to deal with environment and resources, but we also questioned whether there were institutionalized constraints on the government's ability to deliver upon stated goals. The case study discussed here indicates that a gap remains between talk and action, and with respect to the scaling up of participation experiments across the levels of political organization.

Looking to the future, we can speculate about how Canada might change along the lines sketched out in Chapter 10 by Perl and Lee. The "citizen science" initiatives mentioned earlier complement Perl and Lee's three scenarios, particularly the third one, regarding international experience acting as a catalyst for institutional change. Such change is likely to come from progress at several scales at once. Higher-level international environmental initiatives (Chapter 4) are no doubt important, but they may be fragile in the absence of change towards sustainability at several levels across the scale of organization, including the regional and local levels.

References

Anderson, G. 1997. Biophysical Sustainability in a Mountain Ecosystem: Resource Use in the Columbia River Valley near Nakusp, British Columbia. MNRM thesis, Natural Resources Institute, University of Manitoba.

Bengston, D.N. 1994. Changing Forest Values and Ecosystem Management. *Society and Natural Resources* 7: 515-33.

Berkes, F. 2002. Cross-Scale Insti
The Drama of the Commons, edit
and E.U. Weber. Washington, I

Berkes, F., I. Davidson-Hunt, and
Resource Use and Diversity of S
Research and Development 18: 1

Berkes, F., and C. Folke, eds. 199
tices and Social Mechanisms for E

Berkes, F., and J.S. Gardner, eds.
Canada. Winnipeg: Natural Re
umanitoba.ca/institutes/natura

Berkes, F., J.S. Gardner, and A.J.
Resources Management and Su
tional Journal of Sustainable Dev

Bernstein, S. 2001. *The Compron*
versity Press.

Coleman, W.D., and A. Perl. 199
work Analysis. *Political Studies*

CORE (Commission on Resourc
Strategy: A Sustainability Act fo
bc.ca/lrmp/plus/> (17 Decemb

Davidson-Hunt, I., L.C. Duches
Third Millennium: Linking Rese
Forest Product Sector. St. Paul, M

Duffield, C. 1997. Signs and Sign
BC. In *Sustainability of Mountai*
J.S. Gardner. Winnipeg: Natur

Duffield, C., J.S. Gardner, F. Berl
ment of Resource Sustainability
Canada. *Mountain Research an*

Ecological Society of America. 19
on the Scientific Basis for Ecosy
America.

Gadgil, M., P.R. Seshagiri Rao, G.
for Old Knowledge: The Peopl
10: 1251-62.

Hanson, A.J. 1998. Sustainable
ment 39: 167-77.

IUCN/UNEP/WWF (World Con
Worldwide Fund for Nature).
Gland, Switzerland: World Co

Lee, K.N. 1993. *Compass and the*
Washington, DC: Island Press.

Light, S., coord. 1999. *Citizens, S*
Minnesota. Report. Minneapol
Resources; Science Museum o

Ludwig, D. 1993. Environment
Resource Management. *Ecolog*

McLellan, B., J. Flaa, and M. Su
Columbia Mountains. Year 2, P

M'Gonigle, M., and W. Wickwi

Olsson, P., and C. Folke. 2001. I
Ecosystem Management: A St
shed, Sweden. *Ecosystems* 4: 8

Regier, H.A., and G.L. Baskervill
Degraded by Exploitive Devel
by W.C. Clark and R.E. Munn

Sinclair A.J., and A.P. Diduck. 1995. Public Education: An Undervalued Component of the Environmental Assessment Public Involvement Process. *Environmental Impact Assessment Review* 15: 219-40.

–. 2000. Public Involvement in Environmental Impact Assessment: A Case Study of Hydro Development in the Kullu District, Himachal Pradesh, India. *Impact Assessment and Project Appraisal* 18: 63-75.

Sinclair, J., and L. Ham. 2000. Household Adaptive Strategies: Shaping Livelihood Security in the Western Himalaya. *Canadian Journal of Development Studies* 21: 89-112.

Stevens, G. 1997. Property Rights in a Canadian Mountain Ecosystem. MNRM thesis, Natural Resources Institute, University of Manitoba.

WCED (World Commission on Environment and Development). 1987. *Our Common Future*. Oxford: Oxford University Press.

7

Policy Communities and Environmental Policy Integrity: A Tale of Two Canadian Urban Air Quality Initiatives

Anthony Perl

Analyzing Canadian Air Quality Management Efforts Using Policy Communities and Policy Networks

During the 1990s, cities and metropolitan areas in developed nations renewed their efforts to address the problem of urban air pollution generated from transportation sources. Compared to the United States, where the Clean Air Act and its amendments created a national framework for regulating the vehicular emissions contributing to urban air pollution, Canadian provincial and municipal governments have experimented with more disparate policy approaches. Canada's varied initiatives and programs offer a good opportunity for comparative policy analysis. This chapter will use the analytical framework of policy communities and policy networks to assess the integrity gap that has been created by Canada's institutional constraints on formulating and implementing urban environmental initiatives.

Policy communities, and the policy networks that grow out of them, can help categorize the specific interactions among state and societal policy actors into patterns of functional relationships.[1] This allows for more effective interpretation of the influence that public officials, organized interests, governance structures, and other factors play in either constraining or facilitating urban environmental initiatives such as air quality management. The comparative correlation between policy communities and policy outcomes (or non-outcomes) can help explain why environmental initiatives carried out by urban and regional governments are just as likely to suffer from an integrity gap as their national and provincial counterparts.

Policy community analysis represents an analytical technique contributing to the "new institutionalism" in political science, sociology, and economics that calls attention to the influence of organized relationships among political and policy actors (March and Olsen 1989). Conceptually, institutions are defined to represent "the formal rules, compliance procedures,