Coasts Under Stress
Policy Reflections

Rosemary E. Ommer

Coasts Under Stress:

Restructuring and Social-Ecological Health

Policy Reflections

Rosemary E. Ommer

This material is taken from Rosemary E. Ommer and the Coasts Under Stress research project team, *Coasts Under Stress: Understanding Restructuring and Social-Ecological Health.* Montreal and Kingston: McGill-Queen's University Press, forthcoming 2007.

Reprinted 2009

ISBN: 1-894725-05-0

(Social and Economic Papers; 27)

Published by ISER Books - Faculty of Arts Publications
Institute of Social and Economic Research
Memorial University of Newfoundland
St. John's, NL
A1C 5S7

Printed and bound in Canada

Contents

Preface	5
Introduction: The Problem	7
1 The Fishery: Managing for Scarcity	9
Data Problems	10
Individual Transferable Quotas (ITQs)	15
Conservation, Overharvesting Pressures, and Skepticism in Local Fishing Communities	16
Livelihoods	17
Policy Implications	21
2 Forest Products	25
Livelihoods	28
Policy Implications	30
3 Non-Renewable Resources: Mining; Oil and Gas	34
Policy Implications	36
4 The Impact of Restructuring on People's Health and Lives	39
Livelihoods	43
Employment Insurance/Income Assistance	44
The Informal Economy	44
Diet	45
Uncertainty, Stress, Tensions, and Human Health	46
Policy Implications	47
5 Education and the Future	49
Policy Implications	54
6 New Options	57
Aquaculture and Enhancement	57
Tourism	59
Transportation: A Case Study from Labrador	61
Local Initiatives	62
Policy Implications	63
Aquaculture	63
Tourism	63
Transportation	65

Local Initiatives 65
7 New Modes of Governance in the Coastal Zone 67
Marine Governance 67
Governance in the Coastal Zone 70
Conclusion: Final Reflections 73
References 78

Preface

The results of the work of the "Coasts Under Stress" (CUS) project are to be found in numerous journal articles, two films, two booklets, one book, and four edited collections, showing how the various parts of life in coastal communities fit together and how interactive restructuring has generated the risks, threats, and opportunities that coastal communities (human and biophysical) confront. Three of the team books are theme-based. One is on social-ecological knowledge systems and the vital importance and challenges of moving knowledge across disciplinary boundaries, within and between knowledge systems, and from people to researchers to policy-makers to students and back to communities in order to grapple with interactive restructuring and its effects (Lutz and Neis, submitted). One is on the relationship between interactive restructuring and power, whether as energy (oil and gas, hydro), as "power over nature constructs," or as power and agency in nature and human communities (Sinclair and Ommer, 2006). One is on the history of health, diet, and nutrition – with a particular focus on the issue of decreasing food security in places where once-stable food webs have suffered radical shock, as have the cultures of human communities that have always been interdependent with now-endangered food sources (Parrish, Turner, and Solberg, in press). There are two publications for special audiences: one for coastal communities and this one for policy-makers, which is drawn from the principal team-written volume (Ommer and Team, forthcoming).

In all our work, by *environmental restructuring* we mean alterations to the environment, usually at large scales, which are thought to be caused, at least in part, by such things as climate change. We take *social restructuring* to mean changes in society at a range of scales. These result, for example, in alterations in community cohesion, social support, health-care delivery, and the availability of educational resources. Such changes include industrial restructuring, which deals with shifts in patterns of ownership and control and in work environments, and political restructuring, which deals with shifts in policy regimes. We take *health* to be the capacity to cope with stressors and recognize that people are a part of (not outside) nature. *Social-ecological* health is the capacity of the human-natural

world nexus to deal resiliently with change and the stress that it brings (Dolan et al., 2005).

We wish to take this opportunity to thank the Social Sciences and Humanities Research Council of Canada (SSHRC), the Natural Sciences and Engineering Research Council of Canada (NSERC), Memorial University of Newfoundland, and the University of Victoria for major funding of this work and for ongoing support throughout the lifetime of the project. We owe a debt of gratitude to Yves Mougeot and Katharine Benzekri of SSHRC, along with the various SSHRC officers who assisted us, particularly Jacques Critchley, who got us started, Pierre-François LeFol, who was with us in our "middle period," and Michèle Dupuis, who has seen us through to the end. We also wish to express our gratitude to André Isabelle and Anne Alper of NSERC, whose assistance has likewise been invaluable throughout all the years of our work. This project could not have been carried out without a dedicated staff, and we here thank Janet Oliver, Carrie Holcapek, Cathy King, Kari Marks, Angela Drake, and Moira Wainwright for their hard work, constancy, and continued support through thick and thin. We wish also to thank the other universities whose faculty contributed to our work: The University of British Columbia (and, in particular, the Fisheries Centre and the Department of Geography), Dalhousie University, Saint Mary's University, and the University of New Brunswick. Our heartfelt thanks goes to our partners and our advisory boards, and to the Centre for Studies in Religion and Society and the Centre for Earth and Ocean Research, both at the University of Victoria, for providing the west coast part of the team with a home. On the east coast, Memorial University provided a small building for the use of staff, faculty, and students, while on the west coast the University of Victoria gave the Project Director an academic home. We are grateful to both these institutions for their generosity and for their faith in us.

We wish to thank Richard Tallman for his outstanding and thoughtful copy-editing. Special thanks are also due to Philip Cercone of McGill-Queen's University Press for his kind permission for the publication of this booklet, which is drawn from the main volume of Coasts Under Stress research: *Coasts Under Stress: Restructuring and Social-Ecological Health* (Ommer and Team, forthcoming), a McGill-Queen's University Press publication.

Rosemary E. Ommer
University of Victoria
May 2006

Introduction

The Problem

On our east and west coasts, the resources that once supported communities are now all but gone, and local coastal communities, along with the ecosystems that support them, are in serious trouble. Such a crisis should concern us all, because these places are bellwethers for national and global changes that, scientists are warning us, suggest that we are heading towards some very serious environmental collapse and the social chaos consequent upon that. It is clear that we need new ways of thinking about the highly complex links between social and environmental restructuring. How places and people interact to provide social-ecological health or malaise is only now beginning to be understood by scientists of all kinds, including policy-makers. Some policy suggestions culled from our five-plus years of research on those interactions are the subject of this booklet.

Thinking in terms of "social-ecological health" links people and environment together in new and necessary ways. In our in-depth publications (see www.coastsunderstress.ca) we have demonstrated how resource-sector policies that effect change in human behaviour have consequences that can lead either to social, economic, and environmental improvements (as is their purpose) or to biophysical and social distress, which is what happens when the risks, costs, and benefits promoted by such policies are both misunderstood and misaligned. This is why, despite extensive investments in resource management and environmental impact assessments, for example, we have overharvested our fish and forests, put our known mineral and energy resources under pressure, and degraded our marine, terrestrial, and atmospheric habitats. No wonder coastal communities are increasingly in trouble!

Three kinds of *scale mismatches* are primary culprits in this mess. *Spatial scale* mismatches (asymmetries) occur when activities appropriate to one geographical level are applied without due consideration at another, or when the process is wrong and decisions are made at one level that pertain to another and people at that other level (usually, but not always, lower down) are not consulted. Government policy, for example, may be directed at "the individual," when "the community" is the more appropriate target for some policies. *Temporal scale* mismatches occur when major changes are introduced too fast (or too slow) and problems arise from overly rapid, or insufficiently rapid, change. *Organizational scale* mismatches occur when, for example, activities appropriate at the level of the firm are applied to government or community organizations. Different types of asymmetry tend to go together: decisions made at the wrong level run the risk of not applying at different geographical scales; and they may also not match at the temporal scale, if, for example, they are made from a business perspective and do not apply cross-generationally – always a concern for small communities in general, and First Nations in particular. Among the *sources* of misalignment we have uncovered are misdirected flows of benefits that, if they are too short-term or fail to reach resource-dependent regions and generate diversification in them, can lead to overdependence on one resource and a consequent inability to transform the economy when markets falter or the resource is depleted.

The solution now emerging in government and elsewhere is promising. *Multi-scale governance* allows flows of knowledge and readjustments of regulatory power to occur at and across different levels of organization (local, provincial, regional, industrial, and federal). Given that two very different coasts are suffering in similar ways, it is sensible to assume, as these new initiatives do, that human decision-making is both the cause of and the potential solution to the problem. This is a matter of wise managerial choice, which is urgently needed if we are to avoid further serious problems. As a contribution to ongoing new initiatives at several levels, we offer our analysis, topic by topic, of the various manifestations of the present crisis and how these might be resolved.

The Fishery: Managing for Scarcity 1

On the east coast, Labrador's cod and snow crab stocks are in worse shape than those further south. Things grow more slowly in the cold waters off Labrador, and Labrador is the northern limit of the range of these species. Thus, Labrador is the first place we should look to verify the extent to which we are managing for recovery. Despite relatively elaborate scientific and management infrastructures for fisheries, particularly after the extension of 200-mile EEZs (Exclusive Economic Zones) in the 1970s, many fish stocks reached all-time lows in the 1990s. The collapse of east coast groundfish stocks is now agreed to have been the result of the overfishing of stocks, which were already vulnerable because of changing water temperatures: a social-ecological damage scenario. A series of moratoria were subsequently put in place to allow the stocks to recover, but since then, while deep-water fleets now draw profits from stocks caught elsewhere, local emphasis has turned to alternate species, some of which are now also overfished. In 2006, it was widely acknowledged that the Newfoundland and Labrador fishing industry was in crisis. On the west coast, some salmon stocks are also in danger, quite possibly from overfishing and changing water conditions. While many changes have been made on that coast, with 100 per cent observer coverage in some fisheries and video camera surveillance systems on many vessels, along with fleet reduction measures, closures, and other conservation measures that have begun to affect some stocks positively, serious problems persist for small resource-based communities and the small-boat fishery. The lack of social-ecological analysis and remediation has left many east coast and west coast communities in crisis.

This is just not good enough. The east coast groundfish moratoria could have marked a turning point in Canadian fisheries management, given the general agreement between federal scientists, policy-makers, industry, and local people that there were

serious problems of overharvesting and resource degradation, and that new and more effective approaches to science and management were needed. The opportunity for change remains, but effective conservation measures capable of supporting recovery that also take communities into account have remained elusive in the face of continuing scale misalignments in policy initiatives.

Current management and capture discussions now revolve around the dilemma of how to deal with scarce and vulnerable resources in the face of technological overcapacity, global industrial dynamism, and shifting market forces. At the same time, inadequate funding for science (and hence inadequate science) and associated high levels of uncertainty remain. The misfit of contemporary fishery resources, industrial (corporate and owner-operator) needs, and scientific management capacity is now serious. We see *four scarcity issues* whose resolution will be key to solving the root problems in Canadian fisheries management and practice: (1) data problems that underlie the nature and quality of the information available to fisheries science and collaborating fish harvester organizations for accurate stock assessment, partly as a result of very rapid changes in fishing efficiency and practices; (2) the way in which social and economic power, institutional structures and paradigms, and science and management practice interact; (3) the mismatch between management practices and the way in which the marine biophysical environment is seen to be behaving by local communities; and (4) the problems of people's livelihoods in the face of resource depletion. All of these will have to be dealt with in the context of social-ecological *inter*activity, because management practices continue to shape fish capture and to alter (i.e., restructure) the social-ecological situation in which coastal communities find themselves. In all of the following discussion, we take into account the dilemmas that persist in the fishing industry, but the focus here is primarily on the continuing threat on both coasts to the *small-boat fisheries* that are a crucial (although not the sole) lifeline of coastal communities.

DATA PROBLEMS

In the new ecosystem-based management system recommended by Canada's Oceans Act, fishery quotas remain the principal management tool. The scientific data used to calculate quotas must include accurate knowledge of fishing mortality if they are to be useful. This means that actual discard rates and the species composition of discards must be included in the calculation if managers are to be able to estimate the impact of fishing at the stock, population, trophic,

and ecosystem level. Ecosystem management works best at the *regional* level, which is therefore where we need accurate catch data that reflect the full scope of fishing mortality. However, *accurate catch data are impossible to get.* A major problem here is the existence of "data fouling," which is the result of poor fishing practices such as high-grading, discarding, and under-reporting. We do not know how much data fouling actually exists, and the motivations behind it are hard to establish empirically. Landings data only include the landings of fish that are recorded and make it into the formal marketplace, so species (and sizes) of fish with no commercial value historically do not appear there, nor, until recently, did fish harvested for subsistence purposes and sold locally, some of which is still not recorded. Fishery closures, total allowable catch (TAC) regulations, enterprise allocations, and individual quotas have also encouraged such data-fouling practices as misreporting and concealment of catches, dumping, discarding, and high-grading. The rate of dumping plus discarding, estimated to have been 8.4 per cent for cod in 1985, may have reached significant levels by 1986: one estimate suggested that the inshore fisheries discarded 5 per cent by weight in the early 1980s, increasing to 28 per cent in 1989. The 1997 Auditor General's Report still considered Canada's fish stocks data to be inaccurate, due to under-reporting, misreporting, and/or additional fishing mortality caused by unsustainable fishing practices (AGC, 1997). The fishers we interviewed told us that the misreporting of cod is extremely high since, at time of the study and in that area, there was no "official" quota for cod, and where restricted fisheries were permitted for scientific purposes (the sentinel fishery and an index fishery) some thought that under-reporting by weight and misnaming of species were rampant, with cod being recorded as redfish, turbot, mackerel, herring, and capelin, since these were carted by truckloads and not monitored by boatloads.

We have identified some of the gaps in fisheries science for our study areas of the northern Gulf of St. Lawrence and southern Labrador coast, where cuts to stock assessment science are exacerbated by changes in fisheries' practice and in the location of some fish populations. Lobster, which became very important in many parts of Newfoundland in the 1990s, are subject to extreme pressure in some areas, but in 2003 the scientific resources available to monitor the fishery and to assess stock abundance had not expanded to match the need, while those scientific resources that did exist were disproportionately concentrated in some regions. Similar problems exist with crab and shrimp science, where con-

temporary fishing pressure is also intense and where the science capacity is extremely limited.

On the northeast coast and in Labrador most of the cod that survived the overfishing of the 1980s live in the bays rather than in the offshore areas that were the central focus of stock assessment science in the past. Limited fisheries have reduced access to commercial fisheries data, while efforts to develop new indices of abundance with fewer problems than commercial data (such as sentinel fisheries) are relatively new, provide sparse indices, and are somewhat controversial among harvesters and scientists. Some of the surviving cod may be part of local bay stocks (as in Trinity and Placentia Bays, in Gilbert Bay, Labrador, and possibly in the Bay of Islands), but knowledge about the location, life histories, and health of such stocks is limited. Even less is known about many newly commercialized and non-commercialized fisheries. Therefore, we cannot get a good handle on the effects of micro-scale interactions between fisheries and fish populations and the factors responsible for these interactions. Similarly, little is known about the impact of climate change, about changes in the timing and volume of freshwater inputs into these areas, or about micro-scale currents and tidal effects. Because depleted populations tend to have few year classes, and often tend to aggregate as abundance declines, they are particularly susceptible to the effects of environmental fluctuations and of pulse fisheries: we therefore also need to know much more about how environmental changes interact with remnant populations. Harvesters tend to ramp up effort and efficiency in fisheries that are being depleted and then to shift that heightened effort onto other, less abundant species about which we know very little. We still run a strong risk of accelerating degradation of fish stocks and overall marine ecosystems, even with cautious management and the removal of some harvesters and gear, especially when gears are non-selective.

Research vessel surveys, increasingly supplemented with data from sentinel fisheries and other sources, remain the primary basis for stock assessments, providing information on long-term trends in actual abundance of different species and information on year-class, length at age, and diet. The East Coast of North America Strategic Assessment Project (ECNASAP) database was constructed from research vessel survey data collected in the US and Canada (DFO trawl surveys) on living marine resources and their habitats. All Canadian mobile gear surveys follow a stratified random sampling scheme based on depth and, by controlling a range of variables (effort, location, depth, timing), these data provide a statistically valid

and reasonably "objective" means of measuring trends in abundance and distribution of certain species over time. Our assessment of the entire Atlantic Canada marine fish fauna (we analyzed 266 fish species) told us that more than 50 per cent (140 species) occurred in so few years that their status was "data deficient." About 18 per cent (49 species) had decline rates greater than 50 per cent and were therefore "endangered," and only slightly more (20 per cent, 54 species) were "not at risk."

We need to be aware of data problems and realize how they limit our analysis. One must, for example, know the generation time of a species in order to determine the appropriate time period over which abundance change should be calculated. It is also dangerous to extrapolate from a deep-water set of data to shallower waters, where ecosystem dynamics and the social-ecological history may be quite different. ECNASAP data have three basic shortcomings as a tool for historical reconstruction and for understanding interactions among fishing, fish abundance, and ecosystem change.

1. They are somewhat lacking in historical depth, and series do not have consistent start points across the whole region. The Department of Fisheries and Oceans (DFO) uses data sets that began in 1984. In another series beginning in 1970, only eight data points for Atlantic cod are available for North Atlantic Fisheries Organization division 2J (southern Labrador): this is two years after the "killer spike" in landings in 1968. Therefore, trends in abundance or distribution can only be measured from baselines (regardless of which data series) that already represent a heavily fished ecosystem.
2. Because of cost constraints, trawl surveys are not taken throughout the year, so the database contains sporadic data records for certain times of the year that reflect the original sampling strategy. In the northern Gulf, for example, the longest time series of data are derived from August surveys conducted only since 1990. This limits the ability to analyze intra-annual variability in fish distribution resulting from behavioural phenomena such as feeding migrations or spawning aggregations and related variations in the marine environment.
3. Research vessel (RV) data are the result of a sampling technology that limits both the location (depth) and types of fish sampled. Trawl technology cannot be used effectively in shallow areas, and so the database does not contain data records for shallow areas, which have historically been the areas of concentration for the substantial coastal fisheries in the province and include nursery areas for many species.

Until the 1950s, fisheries scientists often addressed gaps in scientific knowledge by drawing on fish harvesters' local ecological knowledge (LEK, or TEK, traditional ecological knowledge). Such admixtures of knowledge are a social-ecological product of interactions between scientists and fishers as knowledge-creators, who pool their historical and present observations, and the social environment that influences what they know, what they observe, and how they interpret that knowledge and those observations. In the early stages of scientific knowledge development in fisheries, catch information was the primary data source, some of it coming from local fishers, little to none from science. As fisheries developed, scientific data were collected and this new knowledge became more and more accepted as the basis for making decisions in the fishery while TEK/LEK was marginalized. In recent years, TEK/LEK has reappeared as a source of knowledge for science and management. However, there remain serious spatial and temporal mismatches of scale between TEK/LEK and scientific data – an issue that has not yet been seriously addressed. This must be resolved, because local ecological knowledge has a clear potential to fill in some of the serious knowledge deficiencies hampering our management of fisheries. If, for example, we can build a substantive knowledge through RV data, landings data, and LEK of abundance trends, life history, and population structures, it will help us see more clearly changes in fishing efficiency and their relationship to fish ecology, fisheries science, and fisheries management. This will help us address the kinds of gaps that brought about the collapse of the northern cod stocks, including the need to comprehend the dynamism of fisheries and the relationship of this dynamism with stock assessments and the impact of fisheries management initiatives. The quality of data available to scientists depends on our understanding this relationship. Since the collapse of the northern cod and northern Gulf cod stocks in the 1980s and 1990s, careful management of the fish that remain, and at smaller spatial scales, has become even more imperative. And it is at smaller scales, both in space and time, where TEK/LEK can be most effective. Such local ecological knowledge could remedy our lack of knowledge about the micro-spatial and temporal-scale dynamics of cod populations in inshore areas, and about the location and health of the habitat upon which cod and other marine species depend. It can also help to address significant information gaps about the social, cultural, and economic dimensions of the fishery at local and regional scales, something that is essential in managing social-ecological systems.

Our publications can provide detailed examples of the use of TEK/LEK in management science. Our detailed studies of changes in landings, effort, and stock abundance are producing fine-grained reconstructions of changes in coastal marine social-ecological systems with a particular focus on fish populations and fish harvesting over the past several decades. They have already provided important insights into the interactions between changes in fish populations, the fisheries, human fishing communities, and fisheries policy over time, which might, we think, eventually be incorporated into simulation models, thereby bridging the gap between macro modelling and micro data. "What-if scenarios" for management initiatives point to the depth of the management challenges facing this fishery and to the need for a comprehensive, multi-pronged approach. Thus, the micro and macro methodologies complement one another.

INDIVIDUAL TRANSFERABLE QUOTAS (ITQS)

Given the huge and well-known literature on ITQs, we focus instead on some of the behaviour that has become manifest as a result of using this management technique to limit fishing effort. In the 1980s, several years before the cod collapses, net lining, dumping, and discarding started in the northern Gulf (Palmer and Sinclair, 1997) along with the first individual quotas. Since then, the use of ITQs as a management instrument has persistently raised concerns about equity in access to stocks, since it encourages larger vessels and concentrates ownership in corporate hands. This concentration of licence ownership, combined with fleet reduction, means that small-scale community-based fishers cannot pay for the number of licences and the amount of technologically advanced gear needed for a viable fishing livelihood. Today, many licences are held by investors who then lease them to fishermen, reducing still further the share of fishing incomes captured by fishers and coastal communities (Cruikshank, 1991).

On the west coast, First Nations' quotas and allocations ensure some local benefit from local resources over time, but halibut, sablefish, and groundfish trawl fisheries now have many quota holders who don't fish themselves; rather, they lease their quotas to others at rates as high as 70-80 per cent of the revenue from the landed catch (Ecotrust Canada, 2004). On the east coast, individual quotas have many of the conservation and management advantages that economists and fisheries managers applaud, but are supposedly non-transferable, since the fleet separation policy of DFO means that IQs are supposed to be held only by fish harvesters and not by processors or others. Unfortunately, increasing evidence indicates

that transferability is occurring, thereby generating real concern that some people in the industry are making an end run around the rules, with hidden (trust) agreements tying harvesters to processors and leading to transfers of control of the resource away from small-boat fishers. These agreements, along with the growing practice of leasing quota, are undermining DFO's fundamental policy goals. Inequities due to removal of self-employment opportunities for current and future fishers and a serious erosion of the economic base of coastal communities are the result (Praxis, 2005).

ITQs are also maladaptive: we are losing TEK/LEK and apprenticeship and training resources. ITQs may be easier for DFO to manage, but they are not healthy for local communities, and – it now appears – not even for the stocks themselves, let alone the ecosystem, which is damaged by the kinds of technologies employed by large fleets, and these technologies destroy seabed morphologies and can produce large amounts of bycatch. Moreover, strong evidence suggests that quota-based management – particularly as the sole or primary approach to management – is not working as it should. Dubious or actually illegal practices certainly are one factor, but, more fundamentally, we do not know enough about either natural or fishing mortality to be sure of how many fish we are managing. Nor do we really understand the interdependencies between the different species that make up any given ecosystem, let alone the impacts of interactivity between fish and fishers on both the ecosystem and the human societies that depend on the resource that is being quota-allocated. This is doubly serious given that, once established, resource rights are hard to reverse. Sadly, fisheries science remains understaffed and underfunded, with the result that there are critical gaps in existing fisheries science. Moreover, some of the management measures currently being pursued, such as quotas, have created enormous problems for the small-boat fishery and its associated coastal communities.

CONSERVATION, OVERHARVESTING PRESSURES, AND SKEPTICISM IN LOCAL FISHING COMMUNITIES

Growing awareness in the 1990s of conservation concerns was reflected in a series of major policy documents, which we will not examine here except to applaud the fact that conservation has recently become a proactive policy goal. While we do not wish in any way to be thought to be arguing against conservation, we must emphasize that conservation policies need to be sensitive to the interactions between fish and fisheries if they are to be effective. In addition, they need to respect not only the needs of the fish, but also

those of fishing communities, many of which are dependent on the small-boat fishery. Conservation measures that offload the costs of management, monitoring, and surveillance onto harvesters, and at the same time ask them to reduce their harvests, can augment the pressure to overharvest.

On both coasts, not only policy-makers but also local people understand the crisis in the stocks. People have shifted where they can to alternative fisheries, but local attitudes remain problematic, particularly when fishers are told one thing and their local experience suggests otherwise. These kinds of issues can be resolved through discussion and co-management structures that bring local people into the debate (see Chapter 7 for more on this).

Multiple conservation strategies are needed that attend to ecosystem health as it relates to community well-being. In other words, co-management structures should focus not only on processing and harvesting, but also on Marine Protected Areas, species-at-risk strategies, recreational fisheries that benefit local employment, and eco-tourist endeavours, and these co-management structures should also account for the survival of a small-boat fishery when that is essential to community survival. Said otherwise, we need to think in terms of both a precautionary approach to the fishery and the development of an adjacency principle in fisheries management that will respect the prior claim of local communities to affordable and equitable fishery-based development. We also desperately need a solution that does not trade off ecology against society – or vice versa. This is a false dichotomy because people have a right to their livelihoods, but those livelihoods depend on the presence of healthy resources and ecosystems. In addition, local people are potentially the best and most effective stewards of those resources. We must not let control of our marine environment be taken over by a geographically footloose high-technology industry, whose vessels can simply move on when stocks are depleted. That will not build either social or ecological security in Canada. It is important to think in terms of the future of both fish stocks and local communities, but employment in these places, as of now, remains a major concern. We turn, therefore, to livelihoods, which are the social part of social-ecological analysis.

LIVELIHOODS

On both coasts, people have traditionally depended on fisheries and/or forestry-related work. Both industries have undergone dramatic restructuring, including substantial downsizing, in the past 15 years. For the east coast, the period between 1985 and 2003 has

been one of substantial downsizing and reorganization within both industries. Fisheries and plants closed and Newfoundland and Labrador groundfish landings shrank substantially between the late 1980s and late 1990s; recovery has been associated with major changes in the shape of the industry in terms of species harvested and processed, products generated, and professionalization. In the absence of cod, fishers in both the inshore (defined as boats under 35 feet) and midshore (35-65 feet boats) sectors are now highly dependent on the harvesting of snow crab, lobster, and, in some cases, shrimp, with shellfish (particularly crab and shrimp fisheries) expanding since the early 1990s to become the dominant species harvested at present.

In 2002, the production value of the provincial fishery reached an all-time high at over $1 billion, with landed value of all fish at $515 million, although $421 million of this (82 per cent) came from shellfish. Shrimp has been less profitable than crab because of problems with low prices and competitive markets and it is very difficult to sustain a fishing enterprise on either lobster or shrimp alone. In particular, harvesters with full-time and supplementary crab licences had higher incomes in the 1990s. In recent years (2004-2006) dwindling crab prices and escalating prices for gas, insurance, and other costs have triggered a cost-price squeeze in this sector. Since the mid-1990s, then, the wealth generated from the fisheries has been much less equitably distributed than it was in the past, despite the introduction of licences and small quotas of crab and shrimp for owners of smaller boats. While specific numbers vary from one region to another, it is not uncommon for harvesters in the midshore fleet to receive quotas that are five to ten times those of inshore harvesters living in the same communities. Crew members' shares of the catch have also tended to decline in recent years relative to those of skippers and boat owners (not always the same individuals).

Those in the processing sector and other fishery-related occupations benefited less from the good crab prices and increased crab and shrimp quotas than harvesters. Most of these individuals have had a hard time making ends meet in the post-cod era, due to low wages and short seasons, and many now face tremendous uncertainty about whether they will be able to remain in their communities in the future. Moreover, changes to the Employment Insurance (EI) program in 1996 have benefited harvesters while penalizing processing workers.

Communities have each been affected a little differently by this sectoral restructuring. The plants that remain in the study area all

have an aging workforce and, at the time of our interviews, many people raised concerns that the same problems were developing with the newer species as had occurred with the cod – shrimp sizes were down, for example, and the market was glutted. The future of the plants, and hence employment, is therefore still a concern; workers also worry about seniority and hours, needing enough time in each season for an EI claim. They also worry about their health, as different occupational hazards come with the new species, such as the respiratory illnesses associated with processing shellfish (Howse et al., forthcoming). On the harvesting side, all areas have seen a reduction in the number of smaller, inshore boats and often increased seasonality within fishing. Rather than training sons or hiring helpers, many inshore fishers are fishing with their wives to keep money in the family. The recent professionalization of fishers has meant increased training costs, and harvesters are also grappling with increased costs and responsibilities for integrated management plans, licensing, observer fees, and dockside monitoring fees. The shift from groundfish to crab and shrimp, along with an increase in the seal hunt in the late 1990s, was associated with an increase in search-and-rescue incidents and compensation claims in the fishery, as vessels designed for fishing one species and for working close to shore began to travel much further offshore.

The interrelated effects of environmental, industrial, political, and social restructuring have altered the context in which individuals, families, and communities try to sustain livelihoods and health. Today, the combination of technological change, globalization, and the cumulative effects of decades of exploitation of the resources are severing the link between corporate success and local employment opportunities. This is reflected in both reductions in the number of jobs in the traditional sectors (fishing, fish processing, and logging) and changes in the nature of the jobs that remain in these sectors (loggers now work on their own, rather than as direct company employees; the structure of fishing crews, vessels, gear, and fishing practices have changed; shellfish processing is more automated and less labour-intensive than groundfish processing; and more processing takes place outside the country). Seasonality has also altered: the fish-processing season has shortened and two-thirds of our respondents reported a decrease in hours worked in the last five years.

There is also a gender dimension to precariousness. Women's employment shows more volatility, with more job changes over time, perhaps because their jobs are more vulnerable (fish processing, tourism, retail sector versus fishing, forestry, construction, trades),

or because they may shift jobs more readily in response to family needs or partner's work. In some cases women are moving from "unpaid" work supporting a family fishing or forestry operation to paid work within family enterprises; in others, women have gone to work to ensure some stability in household incomes when there is insecurity and volatility in husbands' incomes. However, some opportunities have opened up for women and men in tourism, albeit often at significantly lower wages and with less job security than in fish processing.

The fact that more women are fishing with their husbands is best understood as a household response to deteriorating employment options in fishing communities and diminishing incomes from fishing coupled with escalating costs. The strategy is dangerous. It means that husbands and wives frequently have to share some serious vulnerabilities: women are often poorly prepared for the dangers of the job, the couple is literally in the same boat, and thus both are vulnerable to bad weather and other hazards as well as to economic downturns in the small-boat sector.

While conservation measures at the federal level seek to protect overfished stocks, both the industry and local communities have shifted to new fisheries in an attempt to provide industrial flexibility and community resilience. At the same time as employment falls in the wild fisheries, there is increased employment in aquaculture (see below), particularly in British Columbia, although growing evidence now indicates that the increase may be short-lived.

Common themes abound: the coasts have very similar stories. In the 1990s, declining stocks of Pacific salmon, fishing fleet overcapacity, and a 30-50 per cent decline in prices for all salmon species necessitated substantial restructuring of the west coast fishery. The Department of Fisheries and Oceans introduced the Pacific Salmon Revitalization Strategy, referred to as the "Mifflin Plan," in 1996, which aimed to reduce the west coast fishing fleet by 50 per cent over several years, thus conserving threatened salmon stocks and improving the viability of the fishing industry for remaining fishers. This resulted in the buyback of 798 licences and a loss of fisher-related income for 2,750 individuals in the first year of the program. There were also associated job losses in the fishery supply sector (Pacific Salmon Revitalization Plan Review Panel, 1996). By 1999, the number of commercial salmon licences in B.C. had dropped to 2,557, down from 4,112 in 1996.

Many west coast communities traditionally had substantial locally based commercial fishing fleets and some had processing facilities for the commercial fishery, many of which are no longer op-

erating: current restructuring has to be understood as occurring with already severely depleted resources and on the heels of a spiral of downsizing that has been in process since World War II, accelerating in the last decade. As salmon catches declined, some fishers on this coast also turned to other species, such as hake, which have also proven vulnerable to natural fluctuations and overfishing. Further, for many in rural west coast communities, the costs of getting into "new" fisheries or purchasing additional salmon licences (needed for fishing the whole coast as many once did) are prohibitive. For those who remain employed in the commercial fishing industry, the inherent *unpredictability* – erratic harvests, variable fish prices, competition from foreign offshore processing ships, and closure of fish plants – is a source of stress and insecurity.

The downsizing of the commercial fishing industry, implemented to stabilize fish resources available to communities by limiting extraction, has had economic repercussions for individuals and the communities themselves. Among some interviewees, concern that the Mifflin Plan disproportionately impacted small, independent fishers and smaller communities has fuelled grievance against "the south," i.e., the provincial government in Victoria and the corporate interests based in Vancouver. This industry downsizing emphasizes the problems of a lack of economic diversity and dependence on a limited number of industries, which have combined to make communities more vulnerable during economic restructuring. The changes have hit First Nations communities particularly hard. The fishing boats in these communities were often smaller family boats, used commercially only in the short salmon season and providing transportation and access to local food resources during the rest of the year. It was precisely these smaller "less efficient" vessels that the Mifflin Plan targeted in favour of a high-technology, multi-purpose corporate fleet.

POLICY IMPLICATIONS

The restructuring of state policies has been an important component of global restructuring since the 1980s. Reforms within many sectors, including fisheries management, have emphasized privatization, individual responsibility, the targeting of social programs to selected groups, the provision of state support (often through tax cuts) to the corporate world, and in particular economic "efficiency." This has meant a shift in what governments do. In fisheries management, the policy direction has been to limit access to the resource, creating more regulation in the name of market principles and resource sustainability. At the same time, some responsibilities

(monitoring and infrastructure, for example) are being downloaded to fish harvester groups and to lower levels of government, such as port authorities. Issues of environmental sustainability, equity, and economic efficiency continue to play off against one another. Moreover, while on the one hand fish are scarce and (despite global shortages) prices are often low, on the other hand, people have to eat and their communities have to survive. Obviously, then, fishers' insecurity will be heightened when management is quota-based in such a way as to be biased more towards corporate interests than to small local enterprises, at the same time as additional management and harvesting costs erode the livelihoods of coastal people.

Resource degradation and heightened fishing capacity, coupled with an emphasis on efficiency, together mean that we now have far less latitude for error in fisheries management today than we had 30 years ago. Management for recovery will require more comprehensive and finer spatial, temporal, and organizational scale approaches to studying and to managing our fisheries. To do this while also promoting equity and the health of coastal communities will be very challenging. Current fisheries management is bedevilled by mismatches between its scale and system of management and the scale at which the ecosystem functions (see our earlier comments on the need for better science), with the result that fish stocks remain scarce while management regimes encourage misreporting and illegal activities.

Scale mismatches and risk and benefit misalignments need to be identified and dealt with creatively, in ways that take the interactive nature of change in social-ecological marine systems into account. We need to find fiscally feasible ways of creating recovery strategies where the social support for those investing in conservation will be intergenerational in focus, thus reflecting the long-term combined goals of stock and human community recovery. We need multiple conservation strategies that are inclusive of habitat and rich in knowledge about life history, predator-prey interactions, and larger ecosystem processes, and these strategies must also reflect a deep understanding of the human dimensions of fisheries. Science and management need to be more socially inclusive of elders and retired community members as well as of the current and future generations of harvesters, processing workers, and other members of their communities. For this to happen, leadership, innovation, and experimentation need to be encouraged within communities, within government bureaucracies (federal, provincial, and municipal), within science, and within schools and other venues.

More broadly based research in coastal areas, to match that from the deep-sea sector, is also needed. Our shore-based fisheries infrastructure has been passed over to communities, often without the financial and capacity-building support required to protect that infrastructure. In addition, far too little has been invested in assembling, testing, and deepening existing knowledge of fisheries ecology and the state of our marine ecosystems. Likewise, support for local efforts to experiment with different approaches to management and enhancement, and for the transfer of the lessons learned from those experiments, has been inadequate. Where innovative conservation initiatives have happened, such as in Eastport, N.L. (Ommer and Team, forthcoming), these have often been achieved despite government resistance; they also are treated by government as pilot projects that are somehow expected to reproduce themselves spontaneously and without financial and scientific support in other areas. Despite the relatively recent requirement for harvesters to generate conservation management plans, and with the shift to integrated management, much management (and hence capture practices) is still based largely on top-down single-species management – and the science is still running behind actual fisheries practice.

It is clear that greater efforts to incorporate the insights of resource users into decision-making processes will not be sufficient to manage fishery resources effectively. Significant reinvestment in state and academic research will be necessary if we are to improve our very limited understanding of marine ecosystems and increase our likelihood of being able to rehabilitate fish stocks. Improving DFO/fisher/fishery community relationships is going to take a great deal of time, energy, and resources – all of which now appear to be in short supply.

Decisions should be science-driven in the management of natural resources such as fisheries, and the science should not always have to be catching up with what is going on in fisheries practice. The ecological and biological facts about fish – distribution, population structure, etc. – are very important, and are the core of Canadian fisheries. More effective use of local knowledge from fishers needs to be built into the science. Fishers often have knowledge about the spawning and nursery locations and migration patterns of the fish stocks that could be harnessed more effectively to develop a recovery strategy for our fish and shellfish resources based on a co-management structure. Indeed, science and management need to be much more inclusive, working with the knowledge of those who are retired harvesters and with elders: we need to manage for the future,

which is something in which community elders and experienced harvesters have considerable skill. Prognostics are much aided by such input, bringing it within the domain of management science.

Above all, co-management must not mean the abdication of government responsibility for protecting and enhancing marine resources, providing social support, and promoting health in coastal areas. Neither should the price for stock recuperation be community disintegration, deepening social inequities, and related deterioration in the health of fishery people. To date, governments have been unwilling to put the required funding in place to support ongoing recovery of fish *and* fishing communities on both coasts. DFO needs to come to grips with the inadequate state of ocean science; it is also vital that Fisheries officials make a commitment to the long-term survival of a wild fishery, and that they work with other government agencies in pursuit of equity as well as efficiency if our coastal communities are to survive.

Forest Products 2

Canadian coastal communities are experiencing part of the continental-scale downgrading of North American forest resources: landscape-scale reduction in complexity and age of forests logged during the past two decades has been measured through aerial photos, ground surveys, and, more recently, from satellites over Haida Gwaii (Queen Charlotte Islands) and other Pacific coastal forests in western North America (Gowgaia Institute, 2003). On the east coast, a cyclical and competitive industry has continued to become increasingly capital-intensive as surviving companies struggle to increase productivity and thus re-establish threatened profit margins. Local labour feels the pinch and this translates into human stress in forest-dependent places – mill towns like Stephenville and logging towns like Hawke's Bay. Maintaining production, let alone expanding it, has put pressure on environmental resources and led to conflict over how forest resources should be used. We found evidence of local conflict, distrust of external powers, complaints about lax enforcement of regulations, and frustration over limitation of traditional rights of access to wood in places such as Main River.

Through time, there has been an increase in labour productivity in the forestry sector, a favourable trend for some, but not all, workers. That increase has resulted in the number of forest workers declining faster than the decline in volume of wood cut and processed. This throws into question the whole issue of the historical sustainability of the forest industry in Newfoundland. While the quality and benefits associated with employment in the forestry sector have improved for individual workers, each job places an increasing demand on the forest. In 1954, 154 cubic metres of wood represented one job in Newfoundland's pulp and paper industry. By 1989, technological and labour changes in the forests set a job at 651 cubic metres. This is restructuring with a vengeance.

Associated with these changes over the same period has been a consistent change in the effect of people on the landscape. Cutting

prior to 1950 was concentrated along river valleys and lake edges, which provided productive forest sites and easy waterway transport of wood. Over time, cutting has become increasingly dispersed, a pattern facilitated by road construction and heavily subsidized by tax dollars, but also determined by insect disturbances and an oldest-first, regulated-forest cutting policy. The result of this forest management history has been a movement towards an even-age distribution of forests on the landscape, which has complemented the increasingly mechanized industry as paper markets expanded especially outside Canada. The landscape impacts of the forest industry in Newfoundland have rarely mimicked natural disturbances, and ecosystem health under such practices must be seriously questioned.

Policy contexts undoubtedly influence what actually happens in the forests and mills (through regulations, taxation, and financial support) but do not fully determine it. While environmental concerns have resulted in more forest management policies, many operators now find themselves squeezed between conflicting, or contradictory, demands of the companies and the regulatory agents. For example, regulations require that all logs over 15 inches be taken for sawlogs or a fine will be incurred; however, the sawmills will reject 15-inch logs as too small. Loggers will also be fined for butt-junking (cutting away too much rot), but logs with rot will be rejected by the mills. Again, the intensification of harvesting is yet another instance of the reduction of flexibility at the lowest levels of an industry in order to provide flexibility further up the industrial system.

In short, the future offered to rural people by the forest resource remains unclear. Present-day corporate strategies are creating pathways for social-ecological damage, and government policies are leaving local contractors, not the large wood processors, bearing the cost of the environmental regulations, a situation strongly reminiscent of what is happening also in the fishery. When one considers the decreased flexibility now experienced in outport communities as a result of decline in fishing and forestry – the two main foundations of their community survival strategy of occupational pluralism – the resilience of these east coast communities can be seen to be in serious jeopardy.

On the west coast we found an equally problematic social-ecological history that unfolded in essentially the same way. In British Columbia the coastal forests were historically a major source of wealth, with sawmills, concentrated on the southern coast, dominating the industry. The northern coastal areas were of only

marginal interest, with a few sawmills supplying the numerous salmon canneries dotted along the inlets. Government tenure policies were introduced with the intention of stimulating the industry, but the result was a surge of speculation, with timber interests being acquired as investments rather than for harvesting. The early 1980s crisis in the world economy was felt on the coast, at the same time as reports of exhausted forest resources multiplied and it became obvious that companies would have to commence logging in less accessible areas if they were to survive. The unsurprising result was capital flight as "depleted holdings, ageing mills, pollution abatement costs, pressure on the land base from environmentalists and First Nations, the softwood lumber dispute, and the appeal of fast-growing forests in the southern hemisphere all contributed to de-investment" (Rajala, ch. 8). Government faith in the private sector has proved, at best, naive. Corporate flexible production has become the industrial order of the day (as it has on the east coast) and employment has slumped even further as rigidities are shifted downward in the system to the level of communities, households, and workers.

Fisheries and forests have also come into conflict as single-sector policies on both coasts have failed to consider the linkage between sectors for local communities. However, the employment consequences are severe for households and communities as a consequence of difficulties in both sectors occurring simultaneously. Local communities have offered potential solutions, but they have been ignored. Now, however, the principles of a December 1997 Supreme Court ruling (*Delgamuukw*) have legitimated Aboriginal oral evidence, and Aboriginal title, not only to land but also to the resources thereon. On the west coast at least, patterns of negotiation will now have to look different and some community voices will have to be heard, but corporate failure and bankruptcy, along with labour disputes, have taken their toll. As yet, there is no change of political heart, and the sensible solutions proposed by local communities are yet to be taken seriously.

There has also been an ecological impact of west coast forest industry practices on the marine environment. The temporary storage of harvested logs in estuarine areas has been a common practice in many parts of eastern and western Canada for nearly two centuries. While the practice has been severely curtailed in eastern Canada in recent years, this way of dealing with the handling, storage, and marine transportation of logs is still extremely important in British Columbia because of the remoteness and rugged character of most of the coast and the absence of land-based transportation routes.

Estuaries are preferred sites for temporary storage, both because they are usually adjacent to areas accessible by local logging roads and because they have low salinity. The latter is very useful because low salinity inhibits the development of shipworms (teredos, *Bankia setacea*), which are highly destructive of wood.

We developed techniques for the identification of wood debris accumulations, which allowed us to document its extent in areas near log-handling sites. We then characterized the physical and chemical characteristics of sediments in areas where log booming has occurred and compared these to places that had not been used in this way. This allowed us to determine the impacts of the accumulations of wood debris on epifaunal taxa in estuarine areas (for details, see Ommer and Team, forthcoming: ch. 6). Where log booming has occurred, we found very high concentrations of whole logs, in some instances in stacks up to 10 metres high above the sea floor, along with bark concentrations of more than 80 per cent in some locations and an average over the whole study area of about 40 per cent. Our examination of towed seabed videos suggests that large benthic predators avoid wood-dominated habitats: we observed Dungeness crabs (*Cancer magister*), for example, five times more often in the unimpacted areas, while sunflower seastars (*Pycnopodia helianthoides*) were 25 times more abundant in areas without wood debris.

What this means is that we can now say that *the impact of industrial log-storing practices is neither temporary nor trivial.* On the contrary, these practices change both local habitat and the ecosystem to one in which less commercial species replace those that are important for commerce and human diet.

LIVELIHOODS

Now that the traditional industries offer less work as a result of technological changes, resource depletion, and industry concentration, communities and governments have had to adopt a new economic model in which full-time permanent employment is no longer expected. The forestry industry on the Great Northern Peninsula of Newfoundland has seen dramatic changes since the early 1980s, with pulp companies dominating the industry. Instead of hiring their own loggers the practice has been to work with contractors. Furthermore, mechanical harvesters have come to dominate the logging industry over this period, each doing the work of about 12-14 men. As a result there have been considerable changes in the conditions of work and the number of contractors and loggers over the past 15 years (in White Bay South one estimate is that the number of loggers has decreased from around 400 to barely 100).

While some older conventional loggers are able to continue work, younger ones are not being taken on.

This period also coincides with the introduction of new forest management policies and regulations, which have further shaped the industry. As part of an effort to improve the yield from the forest, a modern lumber sector has been encouraged, both by regulatory policies and by government support programs. New integrated sawmills, such as one in White Bay South, provide employment; however, smaller sawmills, like small logging contractors, have trouble in the new milieu.

Restructuring in the B.C. forestry sector, which was always more developed than that of the east coast, is still very similar to it. Large-scale changes in the market economy (e.g., international duties, unstable foreign markets), excess capacity, and degradation of the natural resource base have had serious repercussions for coastal communities dependent, in part, on forestry for employment and community infrastructure. Primary forestry was traditionally an important employer in Port Hardy, Ucluelet, and Tofino, and wood processing has played an integral economic role in Prince Rupert while being an important contributor to the economies of Port Hardy and Ucluelet. All four communities have seen employment opportunities in forestry sectors diminish in the past 10 years, though Port Hardy has been hit less hard than the other three communities.

In Prince Rupert, the closure of the Skeena Cellulose pulp mill in June 2001 had serious repercussions for the community, as it had been the largest private-sector employer in the city. Its closure resulted in the direct job loss of 750 employees and indirect job loss for 1,331 people (Prince Rupert Economic Development Commission, 2002). In a community already experiencing downsizing within the commercial fishery and fish-processing industry, reductions in port activities, and the subsequent closure of another local timber-processing facility in October 2001, the closure of Skeena Cellulose illustrates the economic vulnerability of resource-dependent communities. Elsewhere on the coast, the story is not dissimilar.

The conservation of coastal temperate rain forest in Clayoquot Sound has influenced community health in Tofino and Ucluelet significantly. Within the context of several international conventions to which Canada was a signatory, the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound made recommendations for integrating the knowledge and values of local indigenous and non-Native peoples and for incorporating the most current scientific understanding of forest ecosystem functioning (Clayoquot Sound

Scientific Panel, 1995). In 1995, the provincial government adopted the scientific panel's 120-plus recommendations in their entirety, which rendered obsolete former forestry regulations in the area and ended conventional logging practices in Clayoquot Sound (Ecotrust Canada, 1997). The land-use decisions in this region have had profound, though different, effects in Tofino and Ucluelet, contributing to an expanding tourism industry in Tofino while causing substantial job loss and business closure in Ucluelet.

The perception among many coastal residents is that restructuring within the forestry sector, precipitated by both economic and political decisions, has not only resulted in layoffs from large forestry companies, but has also had negative consequences for small, independently owned operations. In both Port Hardy and Ucluelet, interviewees involved in the forestry industry commented that it is very difficult for small operators to maintain a viable business in the present economic climate. Small forestry businesses that have provided employment and contributed to the local tax base have closed or relocated. There is little incentive for individuals to invest time and money in forestry-based businesses.

Given that industrial restructuring, backed by government policy, has resulted in less employment and also less flexibility for local coastal people, it would appear that government social programs might be expected to help people as they adjust to such restructuring. But such is not the case.

POLICY IMPLICATIONS

Importantly, the species composition, structure, and function of Canadian forests have all been irrevocably altered. The introduction of exotic trees and pathogens has diminished the extent of native trees (e.g., American chestnut, American elm, and eastern and western white pine), fungal and arthropod populations have declined due to air pollution, and changes to decomposition and nitrogen cycling rates have been created by urban heat islands. Overall impacts on biodiversity and resilience of forests due to the conversion of natural forests to tree plantations are largely unknown, but initial evidence suggests that regulated, even-aged forests support a simpler food chain and result in altered nutrient cycling when compared with probable pre-European conditions.

As in fisheries, little attention has been paid in industrial forestry to forest species other than economically important "fibre" species. And, as in fisheries ecosystems, the alteration of natural forest ecosystems proceeds apace without due consideration of possible (even probable) consequences. The replacement of old-growth

forests (with their diverse age structures and multiple successional stages, which result from natural and indigenous disturbance regimes such as fire) has already had unforeseen consequences in terms of infestation, loss of biodiversity, fire, mudslides, and other such hazards. We have also lost opportunities for regional diversification through the large-scale export of raw logs and other primary forest products. Nor do we know the effect of wholesale exploitation of commercial species on the totality of forest ecosystem services.

Research elsewhere is now showing that, in natural situations, gap disturbance determines forest structure and processes more than was previously assumed. We also now know that a higher incidence of fragmentation on the landscape scale is created by logging, compared to wildfire depredations, and that forestry activities have operated within a much narrower range of variability in emulating fire cycles than the large range of natural variability. Moreover, an overall reduction in diversity due to industrial forestry practices has been noted for tropical forests, while the risks to temperate and boreal forest populations and habitats are potentially high in terms of lost ecosystem services alone. Worse still, changes in climate or other environmental thresholds can produce unexpected results in mismanaged forests – "catastrophic regime shifts" can be anticipated, in which a system can have alternative attractors on a landscape scale, even if this does not occur on a local scale. Obviously, such shifts in forest ecosystems will impact aquatic and marine ecosystems as well, for example, in the effects of logging on salmonid habitat or the impacts of ocean log dumping and storage on benthic communities and productivity. There is a real need to improve foreshore lease relinquishment regulations for forest practices. We also need surveys – before, during, and after industrial use – that assess the status of the foreshore and subtidal lease adequately. These need to become standard governmental practice. A generic restoration program for heavily impacted sites should also be established.

The forest products industry has become more global in the last few decades, and in the global market there is pressure to compete through cheaper sources of raw materials (fast-growing pine plantations in the southern US, for example). In the context of both coasts, this has translated into local strategies to harvest a dwindling supply of wood more cheaply. While this pressure is not new, the pace of change has escalated in recent decades. The tools used by the companies in their quest for raw material and to protect profits include political pressure to preserve and enhance priority access to forests, technological innovation, and restructuring of labour relations.

However, the outcomes are becoming highly contested, given the competing interests of other forest industry actors (sawmill operators, loggers, contractors), other forest users (ecotourism operators, guides), and environmental groups. In recent years, the competition has intensified as the resource has become depleted and as the employment the pulp and paper companies can offer to people living in forest hinterlands has dwindled.

Nonetheless, as the locus of natural-resource exploitation and consumption has shifted from the local to the global, the residents of our coastal study areas have experienced tremendous pressure on local forest resources in a globalizing economy much as they have in the fishing industry. The legal recognition that First Nations' rights have been alienated may help to redress some of the inequities of history on the west coast. It is to be hoped that on the east coast, where settlers also had claims that predate those of corporations (albeit without the time depth that applies to First Nations), coastal communities may find governments prepared to take more note of community rights. But to this point, in the forestry sector as in the fishery, local communities' needs and rights, and the health of the environment, have received seriously inadequate attention. The passing down of rigidities to the local level and the subsequent ignoring of recommendations at the community level that might restore flexibility and community resilience do not bode well for the future.

The underlying pattern in the industry has been that of the creation of environmental degradation, coupled with market and technological vulnerability, which is global in scale. To date, this inexorable pattern has resulted in significant social-ecological distress. The forest products industry on both coasts has created significant damage, which over the long term has had an impact on both the environment and society in which it operated. Sadly, government policies on both coasts until very recently (and again now in B.C.) have demonstrated an inability to think beyond a mono-staple mindset and a very rigid and narrow idea of what constitutes development. Local people in this sector have been seen, time and time again, as "the problem," with industry viewed as "the solution." Resource depletion has passed unnoticed – unless it has been perpetrated by local communities, and then the reasons why this might happen have been totally ignored. Governments continue to be caught in a mental staple trap, rarely thinking even out of the forest box into diversification or local control, and never into local development and flexibility. The flexibilities that have been approved in this sector on both coasts have been corporate, although the evidence for both coasts is

that this has not, and does not, and cannot benefit regional economies and coastal communities. This is fundamentally important in the light of a global context of decreasing forest ecological health.

Non-Renewable Resources: Mining; Oil and Gas 3

There has been a history in the non-renewable resource sector of governments being seduced by large capital investment and major short-term employment potential into promoting resource industries as a panacea for economic ills. This is at least in part because such industries pose a significant "entry problem" for small-scale enterprises or local communities since the extraction of such natural resources requires heavy capital investments in technology and infrastructure. Moreover, the nature of the extraction processes are such that their potential to affect human and environmental health adversely is considerable, and considerable consequences then arise for people, communities, and ecosystems.

The story of mineral resources on both coasts is one of ecological damage, some environmental protection, economic development, underdevelopment, and non-development. Though many things were different on the two coasts, and many things changed over time, other factors remained fairly constant on both coasts:

- a close relationship between business and political interests;
- a depiction of the regions' mineral potential as a key ingredient in the industrial possibilities of the region;
- a willingness on the part of government to grant incentives and concessions to possible developers in order to stimulate industrial development;
- a tendency to downplay or ignore considerations of safety and environmental impacts in exchange for jobs;
- a marked lack of security and control that can be the result of outside ownership of an unpredictable industry;
- the maintenance of economic and technical ties with mining interests from Britain, Canada, and the U.S.

At the same time, these industries have provided much-needed employment, helped to open up land-based resources, and spurred

infrastructural initiatives, so they were in some ways useful as well as politically and economically attractive. However, they brought with them ecological impacts on the affected areas, including (for mining) air pollution and damage of local vegetation, with many of the environmental impacts still evident in the soil. The detailed stories of the communities considered here reveal much about the perils of the mineral non-renewable resource sector, the kind of "development" it entails, and its implications for economic sustainability and human and environmental health. The notion of pursuing development through large-scale, resource-extractive industries, and of attracting investment and creating employment through concessions, is still very much with us in debates surrounding, for example, the discovery and extraction of the large nickel deposits at Voisey's Bay in Labrador.

It is, therefore, encouraging to see that some lessons have been learned with respect to the modern east coast oil and gas industry. The process that carries an environmental impact statement (EIS) to an environmental protection plan (EPP) and then to an environmental effects monitoring (EEM) program has evolved on the east coast over nearly 20 years. The result has been an EEM program that has real community input and a strong science basis that rests on the principle that effects are predicted and then tested by EEM, and the rigour of this design exceeds that generally used elsewhere in the world. The overall lesson has been that a good environmental program results when community input is embodied in the EPP process and when predictions of effects are tested.

To compare the history of offshore oil and gas development on the east and west coasts of Canada is to see that some lessons about the prosecution of non-renewable resources have been learned, while others have not. Once again the political context is important, framing both the manner of resource exploitation (regulations) and its revenue outcomes (jurisdiction). We found that regulation of oil and gas in Newfoundland, in the short term, has been effective from a social-ecological point of view. The process has been successful in engaging the community in the assessment and monitoring process for the environment. Newfoundland and Labrador currently has one of the fastest growing provincial economies in Canada as a result of post-construction activity generated by oil development.

In the Queen Charlotte and Tofino Basins on the west coast, our work produced new interpretations of old issues, as well as new results made possible by new technologies. In the QCB, when archival seismic data were reviewed and basin structures and faults interpreted, deficiencies were found in the existing data sets. Sea-floor

geohazards have been identified and linked to subsurface structures. Also, sea-floor habitats have been identified and assessed for biological productivity and possible Marine Protected Areas. The new technology and the surveys we carried out can be applied in any of the B.C. coastal basins.

In terms of oil and gas potential on the west coast, we confirm that the QCB has the best prospects for oil and gas development, being both the largest of the four basins and with what appear to be the most reserves. The Tofino Basin appears to be promising with respect to gas, but the prospects for oil are less clear. The Winona Basin, lying to the northwest of the Tofino Basin, is the least likely prospect and would probably be the most difficult to develop. That said, it is not yet clear how much oil and gas is out there, but it appears to be less than was originally thought.

POLICY IMPLICATIONS

We conclude overall that non-renewable resources have always been viewed as important opportunities to diversify the economy beyond traditional sectors, despite the fact that, like all staple industries, they have always been influenced by economic developments external to the provinces. This is even more pronounced today as national and provincial economic restructuring makes them more highly integrated in the national, continental, and global arenas.

With oil and gas, Newfoundland and Labrador sought to avoid the boom-and-bust cycle that had characterized earlier non-renewable resource development. Thus, the long fight for ownership ensued, as governmental cross-scale inequities were feared, on top of the other losses of control that the role of transnational corporations and the need for foreign investment bring with them.

The rhetoric of development on the east coast (though marked by some key differences from the earlier period) is still with us. However, awareness of environmental and (on the west coast) First Nations issues are new, while the interplay on both coasts of national and provincial politics remains a crucial aspect of resource development. Modern oil and gas development has the added dimension of modern fiscal arrangements to consider, making the deal concluded between the federal government and the Newfoundland and Labrador government in January 2005 important because it positions the province to capture the full benefit of the resource within its period of exploitation.

The socio-economic outcomes of potential offshore oil and gas development and production on the west coast are very much on the

public agenda as issues are brought to the forefront and new studies and research are initiated. Primarily, concerns have been raised about the potential environmental effects, but economic and social implications have also come into play: the overall issue is one of social-ecological health. Before development can proceed, appropriate fiscal and regulatory regimes will be necessary to address environmental and other concerns. Agreements will need to be negotiated over revenue-sharing from oil and gas at the federal, provincial, and municipal levels; assurance will have to be given to First Nations peoples about revenue, land, and marine usage; ownership rights and best-practice environmental protection will have to be resolved fairly; and assurances will also need to be given to other coastal communities about best social-ecological health practices. Following all this, industry will need to judge whether or not the investment is worthwhile.

For the province of British Columbia, the economic benefits of offshore oil and gas production could be significant, although how such benefits might be distributed, and whether or not coastal communities would partake significantly in such benefits, remains to be seen. Benefits are likely to occur in the form of direct and indirect increases in incomes and employment at the exploration, development, and production stages of energy activity, with the greatest annual impact likely to be at the development stage. In addition, the province will benefit from enhanced infrastructure, an increase in trained labour, expansion of knowledge, and new knowledge acquisition in a range of service sectors. Handled well, this will underpin future economic development. The provincial treasury will also benefit from royalty and other revenues derived from oil and gas activity (assuming that the new accord, should it occur, would resolve current problems over clawback of revenues), as well as from taxes levied on labour income, company profit, and expenditures on commodities generated through initial and subsequent round spending in the multiplier process.

At the regional level, larger coastal communities (e.g., Prince Rupert, Port Alberni) may have economic benefits if they support supply centres or other service industries, although some communities may be too small to supply what industry needs. If coastal people are to benefit, it is likely to be mostly through jobs on the rigs or at the supply bases rather than at home, and through possible revenue-sharing with the provincial and federal governments, local spending from any "legacy" or savings fund that might be set up, or local benefit agreements. At the sectoral level, it will be necessary to guard against negative impacts on the fisheries, tourism, and aq-

uaculture. Increased opportunities associated with the industry will attract transient workers and, if communities are not careful, attendant social problems. In short, any development of coastal oil and gas reserves needs to be cognizant of the importance of guarding against damage to social-ecological health – environmental risks and negative socio-cultural impacts, including effects on Aboriginal livelihoods, heritage, and ways of life, as family stresses associated with shift work and differential job opportunities will undoubtedly arise. The "good news" is that examples exist of ways to guard against these ills.

The Impact of Restructuring on People's Health and Lives 4

With few exceptions, the communities in our study areas have experienced *declines in population* that are related to migration but also to changing birth rates. Particularly in rural Newfoundland and Labrador, migration has been a long-term adaptation by local people to perceived opportunity elsewhere and moving away is something that many individuals on both coasts consider, even in relatively good times. However, *it has profound effects on the local society when most of the youth, whole households, and even a majority of local residents take this decision.* The most marked recent west coast decline occurred in Prince Rupert, where the population decreased by 11.8 per cent from 1991 to 2001, all of which came after 1996. Port Hardy, on northern Vancouver Island, has seen similar changes; the population declined by roughly 13.4 per cent between 1996 and 2001 following an increase in the previous five years. The sole exception is Tofino; owing to its flourishing tourism-based economy, the population increased by 33 per cent from 1991 to 2001. In comparison, the population of B.C. grew by 16 per cent between 1991 and 2001 (all numbers based on Statistics Canada, 2001).

The most dramatic change occurred in the years 1996-2001 when all five areas on both coasts lost substantial population, with only Alberni-Clayoquot substantially better than any other. However, in the previous five years, the study areas on the east coast were already losing significant numbers of people while the B.C. districts were still holding steady or growing slightly. Moreover, the population in the east coast Grenfell Health Region (which contains many of the communities we have studied) declined by 18 per cent, from 19,345 to 15,805 between 1991 and 2001, with out-migration of young people being a major component of this decline. A similar set of demographic trends has been observed for Newfoundland's Western Health Region, which contains the rest of our study area

communities, but also includes the southwestern part of the island, an area we did not research.

Why? In the late 1990s, much of rural B.C. experienced contraction in its important logging and wood-processing industries as a result of lumber duties imposed by the United States and poor markets for many paper products. In addition, depleted stocks of salmon and other commercial species caused problems in the fisheries. Although the coastal areas we have studied in B.C. often have significant tourist and aquaculture enterprises, these did not fully compensate and populations fell. The continuing influx of people to Tofino sets it apart from the other study communities. On the east coast, some areas appear in desperate condition, the exception being Charlottetown, southern Labrador, where crab fishing and, more recently, shrimp processing were successfully expanded after the cod moratorium and construction of the Labrador road contributed to population growth. However, Port Hope Simpson, a forestry-dependent community with a smaller fishing sector, demonstrates that the experience of Charlottetown (and Mary's Harbour) was not uniform in southern Labrador. Moreover, the completion of the Trans-Labrador Highway and a succession of substantial quota cuts in the crab fishery up to 2005 may accelerate out-migration in these areas if alternative employment opportunities are not found.

One of the known contributors to human stress is *financial insecurity*. The Statistics Canada Survey of Financial Security shows that, on a basis comparable to 1984, Canadian median net after-tax income of family units was virtually unchanged in 1999, although median net worth had risen by 11 per cent. However, significant evidence indicates increasing wealth inequality: family units in Newfoundland had the smallest median net worth, and the median worth of young couples across the country fell by 30 per cent, although median net worth of all families rose by 10 per cent. Moreover, B.C. was shown to "be home to both the highest average wealth in Canada and the largest gap between the richest and poorest households." There was no breakdown available for coastal communities specifically in these reports but it should be noted that income inequalities between rich and poor groups or areas have been identified in the population health literature as correlates of mortality and morbidity differences. Low educational attainment (measured by the percentage of the population with less than high school education) was similar in all our study areas and much higher than Canadian averages. In other respects the two east coast regions are notably worse off than those on the west coast. They show much higher dependence on government transfer incomes,

with median personal incomes more than $5,000 lower than in the poorest B.C. region and much higher unemployment rates. The Grenfell region on Newfoundland's Northern Peninsula experienced the highest out-migration of all regions and still fares worse on four out of five measures. Clearly, the high rates of out-migration have not left those still living in the areas with adequate employment and independent incomes. We conclude that, to some degree, people in coastal communities are finding that they have to "vote with their feet" and, where they cannot create new local opportunities for community and household survival, move to other places. The pressures on these coastal peoples are significant.

Can we say, however, that their health is suffering as a result of the multiple stressors that restructuring has brought to bear upon their lives? We know that the *health of communities* (as entities distinct from their resident populations) depends on the quality of their physical and social environments and can be measured in terms of indicators such as pollution levels, crime rates, population dynamics, employment and educational opportunity, family stability, and social capital and social cohesion. Anecdotal evidence suggests that community stress, linked to industrial change and economic uncertainty, has had negative *psychosocial effects*, including increased depression, dysfunctional family relations, and alcohol and drug abuse. Our work has identified community health as vulnerable to the impacts of restructuring on both coasts. Details are in our books and articles (see www.coastsunderstress.ca/publications.php).

Given this, it is perhaps surprising that people on both coasts expressed a high level of satisfaction with their communities, despite the unemployment and the extent of population loss. They valued the social relationships and qualities associated with the physical environment of their communities. The recent population health research literature has also emphasized the importance of social capital and social cohesion as indicators of community health and well-being and as social determinants of personal health. We found that community attachment was strongly correlated with community satisfaction. That said, we found on the west coast that residents in Tofino and Ucluelet were more optimistic about the economic outlook and social conditions in their communities than the residents of Port Hardy and Prince Rupert. Findings on the east coast suggested that other areas were somewhat more optimistic than those that were highly fishery-dependent and where the aftermath of the fishery crisis left them with greater loss. On both coasts people emphasized that more economic diversity meant greater buffering potential in an economic or resource crisis.

Our surveys also told us about personal health. Overall, all the communities reported poorer health than either the province or the country as a whole. Among the four west coast communities, the poorest health was reported for Prince Rupert and Port Hardy, the places most seriously impacted by restructuring. Likewise on the east coast, the poorest health was reported by those places with a longer experience of restructuring. We asked residents on both coasts how stressful they considered their lives as a whole, to rate seven specific sources of potential stress, and to compare their overall stress levels to a year ago. The percentage from the west coast reporting their lives as either not at all stressful or slightly stressful was quite high, at 55 per cent, with little variability by community. The percentage reporting that their lives were either considerably or very stressful was therefore correspondingly low, at 12 per cent overall, which was also quite uniform across the four communities. On the east coast, these trends were repeated with a small percentage of respondents across the three research areas rating their level of stress as considerably/very stressful. The overall percentage was lower than that reported for the west coast. Using the Canadian Community Health Survey data for a comparison with national and provincial statistics, we found that reported stress is considerably higher in Canada as a whole (26 per cent) and B.C. as a whole (24 per cent) than in our four west coast communities (12 per cent). While this result on first sight may appear counter-intuitive, given the socio-economic conditions and stressors in the communities we studied, it is consistent with findings from other studies that show lower levels of stress for smaller communities relative to urban centres. We were told by many survey respondents that the local environment was a key factor in mitigating individual stress: highly developed social networks among residents, a strong sense of safety, and an absence of the typical urban stresses of traffic and pollution were considered reasons for low stress levels. Easy access to wilderness areas and availability of clean water and air were also cited as environmental features that eased or prevented stress. All of these factors would hold for the east coast findings as well. People in these areas, while admitting that they were concerned with their financial situation and worried over the future of their communities, could somehow put these concerns into perspective and this translated into lower perceived stress levels.

Taken overall, our findings reported for demographic and income changes show quite profound effects for both east and west coast communities that are consistent with and plausibly attributed to restructuring processes and events. In terms of population

health, community variations in mortality and morbidity rates, when compared with provincial rates, are suggestive of restructuring effects even though direct attribution cannot be inferred from the ecological analysis. In combination our results mean that those communities on both coasts that had experienced the most recent and severe disruptions as a result of restructuring had both poorer health and greater mental stress.

LIVELIHOODS

People live the consequences of restructuring in their lives at work and at home, in their bodies and in their spirit. In our fishing and forest products chapters, we reflected that scale mismatches in policy (created with the nation and province in mind, but without adequate understanding of their impacts on local communities) result in benefits being directed away from local producers, who are then left to face the uncertainties and risks of a globalizing economy without the ability to generate many choices for survival. People also told us about key changes in income security policies, especially EI and workers' compensation, as well as factors affecting their livelihoods, including the kind and amount of unpaid work required (such as care of family members in the context of reduced local medical services), and the reduced availability of traditional subsistence resources such as fish or wood. These apparently disparate bicoastal economies share bitter experiences at the level of the households, and the human face of their struggle is seen in the health impacts of these changing dynamics: visible in the anxiety and stress caused by uncertainty. *We know from all our work that the health of communities as resilient places and as networks is negatively affected by a combination of various kinds of restructuring, although there remains surprising strength in these places and among these people.*

Over the past 20 years, the coasts have been seriously affected by resource degradation (the environmental health component in social-ecological health), changing resource management regimes, industrial restructuring, and related changes in employment opportunities within and between the fisheries, forestry, tourism, and service sectors. On both coasts the consensus is that the economy is not healthy and that the local economic situation is precarious. This crisis has been sharpened by a downturn in several sectors at the same time. We focus here on four major social issues: (1) changes in EI; (2) the informal economy; (3) diet; and (4) uncertainty, stress, and tension.

Employment Insurance/Income Assistance

At the same time as the fishing and forestry industries have been undergoing a process of restructuring and downsizing on both coasts, and tourism and aquaculture have been on the rise, changes have also been taking place in some support programs of critical importance to these largely rural, seasonal, and often relatively low-income women and men. In a high unemployment region, where the unemployment rate is greater than 13.1 per cent (as is the case with our east coast communities), shorter seasons in fish processing have made Employment Insurance (EI) regulations difficult for plant workers, and most tourism operators find it impossible to provide the required amount of employment for their workers. Tourist operators have had trouble attracting labour, and fish-plant workers are competing among each other for "stamps." The new entrant EI regulations (more than 490 hours of insurable earnings or benefits in the year before the qualifying year) also cause difficulty, making it very hard to recover lost eligibility associated with one bad year.

EI changes have also made it more difficult for unemployed people to qualify for retraining and educational support, and workers go to great lengths, often to the detriment of their health or family life, to try to qualify for EI and avoid the re-entrant trap.

On both coasts there is a strong sense that changes to EI and income assistance (IA) regulations have made it more difficult for people experiencing employment difficulties to access social support. Within the fishing industry, shortened seasons at fish plants and reduced commercial fisheries openings prevent many processing workers and some fish harvesters from qualifying for EI for the duration of the off-season. In B.C. new provincial regulations governing IA have also proved challenging, and some people face the necessity of having to sell off personal assets in order to qualify for IA. First Nations communities are also affected and face the additional challenge of being legally assigned to reserves, which were central locations for the fishing industry of the late nineteenth century but are now suffering the effects of a declining commercial fishing industry and remoteness from most other sources of employment. The provincial delivery of social assistance has served to undermine community cohesion and enterprise in Aboriginal communities even further.

The Informal Economy

What has happened to the role of the informal or subsistence economy in household livelihoods? This "unpaid" economy has been

critical throughout the history of settlement in rural Newfoundland and Labrador and in remote settler and First Nations communities in British Columbia, and such activities and support networks remain vital components of rural livelihoods. Subsistence and wage jobs are usually interdependent – subsistence activities stretch scarce dollars and cash is needed to fuel the subsistence pump, thereby adding to (or being instead of) money from social programs. Many subsistence activities, of course, also have a cultural and recreational value and are not just engaged in for livelihood purposes. We found that many traditional subsistence activities were alive and well, though some traditional opportunities have been eroded by restructuring. However, constraints on access to cash and to people with the skills and means to carry out such activities as house repairs or construction could seriously jeopardize subsistence in the future.

People still value going on the land and some still engage in a fairly traditional seasonal round of work – some paid and some unpaid. Environmental changes, however, threaten subsistence activity, and resource management policies further limit traditional access – these policies are often perceived to be inequitable. Some people lack start-up capital for subsistence activities, while others turn to subsistence activities when other livelihood options decline. The development of a business crafted out of subsistence activities is becoming more common on both coasts – bakeapple and partridgeberry jams and syrups for sale to tourists and export is one example of what is really *local diversification without government blessing.*

Diet

One common but usually unrecognized effect of interactive social-ecological restructuring has been dietary change – for communities and households and in school meal services, for example. Such impacts speak to problems of mismatch of risks and benefits of restructuring, and are yet another example of how local communities are bearing imbalanced risks as the wider provincial, national, and international economy restructures and as local diet solutions fall prey to ecosystem degradation. It is important to know the nature of such changes because of potential present and future human health (for better or worse) impacts, and because of the close relationship that exists among diet, community satisfaction, culture, and way of life. Food is a vital cultural expression. Food security, then, speaks to physical health and cultural and emotional health and well-being – and, by extension, environmental well-being

also since, in small local communities, usually a substantial component of people's activity involves growing (or protecting the growth of), harvesting, and preparing local foodstuffs.

A considerable amount of work has to be done on improving diets in rural communities. Some of the factors that contribute to poorer nutritional practices are inadequate dietary education, inadequate quality and selection of food by food suppliers, inadequate nutrition programs in the school. Alleviation of all of these is feasible and not particularly costly to achieve. It is, however, also important not to ignore larger issues that influence food purchase and thus consumption: adequate household incomes, the relative cost of different types of food, legislation of food quality, and the advertising of certain products. In this respect, broader pressures are beginning to have an effect on the quality of "junk" food, as the pressure to remove trans-fats in french fries, for example, becomes fashionable. What we know as a result of our work is that social-ecological restructuring has penetrated coastal communities right down to the level of food consumption and food security, having had a significant effect on traditional local diets and thus on the health of local communities. This is a fine example of the kind of unwitting cascade of effects that social-ecological restructuring has imposed on coastal communities over time, and it will take raised awareness at the levels of families, schools, municipalities, and provincial and federal departments to restore security to these places.

Uncertainty, Stress, Tensions, and Human Health

Life on the coasts has become increasingly stressful, to a degree mediated by household responsibilities, gender, and age and stage of life. Lack of stability and security in employment affects a person's ability to plan for the future, and many people talk about the mental stress associated with financial uncertainty. Mental stress is an important part of human health, but it rarely stands alone. The problem is the ongoing struggle to make ends meet. There is a strong correlation between healthy families and healthy communities. Families need economic stability in the form of secure employment opportunities and access to supportive community services and social networks in order to be healthy and resilient. Conversely, strong families are essential to promoting and maintaining healthy communities. Clearly, unemployment and underemployment due to resource-sector restructuring, coupled with reductions in social services and changes to Employment Insurance and income assistance regulations, are proving extremely challenging for many families in these coastal communities.

Finally, it is important to remember that food is more than physical sustenance: to lose local food production and local knowledge about foods is to endanger cultural as well as physical health, while producing unnecessary stress on household food budgets.

POLICY IMPLICATIONS

Our findings should prompt new thinking about how families cope with the collapse of one or more of their economic "modes." One of the conceptual problems people and their politicians have to face when coming to grips with the human impact of restructuring is that the political-economic focus on cash incomes and the prioritizing of per capita or household cash income as an indicator of health and success miss an important part of the story. Perspectives based on cash income reduce people to being inputs into a production process. That implies that individual incomes could be maximized by moving away from declining places. In this view, the effects on households, on the gendered division of work, and on intergenerational transfers of knowledge, culture, access to, and ownership of resource niches are ignored, and communities become disposable nodes in a production network.

People actually make decisions based on household and larger needs; their lives are made up of more than cash income, and their decisions are based on balancing many factors, such as caring responsibilities, community health, environmental health, cultural resources, familial connections, and traditional roots in communities. Taken together, these make up the strategies for decision-making that seek successful and healthy households and communities. Cash inputs into a family economy are put together with other inputs from the informal (hunting, fishing, barter, gift, labour exchange) economy and from state transfer payments in order to feed, house, and clothe a family. This produces a *household economy that is both productive and highly flexible.* That is why policy-makers need to keep in mind that disturbing that balance – through strategies that create flexibility for business firms by downloading rigidity from the firm to the household – will necessarily damage local communities. As post-industrial restructuring takes place in industry, what had been firm rigidities before restructuring have been removed – the kinds of protections and restrictions that unions and workforces used to be able to impose on employers have eroded to the point where they no longer are factors. Instead, industry has gained flexibility by imposing constraints on the working population, whether piecework, contracting out, or other strategies by which firms have been able to remain competitive in a global mar-

ketplace where cheap labour in developing countries forces industry to make cost-saving adjustments wherever possible. This new burden has been exacerbated by cross-scale and cross-sector lack of coordination – witness government cutbacks and cost-saving adjustment in the institutional (provincial and federal government resource management regimes and income and health-care regulations) infrastructures.

Work, *it must be realized, is about more than a paycheque; it is also a key element in a way of life for most coastal families.* Should the work fail, they will be losing not only their jobs but also their homes and community networks, and these communities may well disappear or be reduced to hamlets of temporary homes.

At the same time, we have discovered a remarkable resilience among coastal people, which is particularly striking in the face of scientific, industrial, and policy initiatives that have failed to nurture and sustain coastal communities. Restructuring of the various resource sectors has affected the availability and quality of local employment, community population numbers, family security and stability, and community social capital, while the concurrent restructuring of Employment Insurance and social assistance has, in some instances, actually exacerbated already challenging economic situations for individuals and communities. Sadly, it is also the case that state infrastructure, far from assisting and supporting communities as they seek to reorganize to be dynamic contributing partners in the Canadian federation, has in many cases made matters worse, following initiatives that are more likely to challenge and undermine the resilience of these people and the places they call home than to nurture what is a rich Canadian heritage of culture and place.

Education and the Future 5

While restructuring was a prominent feature of the late twentieth century and has occurred at the global, national, and local levels, not all communities have been affected in the same way. The characteristics of any given community and its inhabitants influence how people handle their circumstances, as do age, gender, and/or developmental stage.

On the east coast, the imperatives of efficiency and competitiveness have triggered profound changes within primary and secondary education as Canadian society develops a "knowledge economy" with which to maintain its place in the changing world economy. In the mid-1990s one part of the cascade of effects from federal efficiency measures was the emptying of provincial coffers throughout the country, which then created strong pressures for school board consolidation and reorientation of primary and secondary education to meet the needs of urban-based new economy firms for technologically skilled, flexible, and above all, mobile workers. The small rural school has been seen as an obstacle to this and the government of Newfoundland and Labrador has, over the past decade, proceeded to overhaul governance structures within the province's school system and accelerate the pace of rural school closures. In addition to widening the disparity between town and outport schools, this quasi-privatization of education has resulted in work intensification for the remaining school staff. Although the specifics of reform vary across the country, the general thrust of reduced cash, increased extracurricular workload for teachers and principals, and a strong sense of frustration with aging facilities and inadequate government support are all shared by schools throughout the coastal communities we have studied. Rigidities caused by lack of resources are making it very difficult for schools outside main urban areas to respond creatively to the training requirements of the new knowledge economy, and in practice these inflexibilities are op-

erating as increasingly serious constraints on education in coastal communities.

Most students now intend to continue their education after high school, thinking that a "good life" would be one with a good job, lots of money, and family and friends, and more rural school students than urban students think they would be able to have the education and career to which they aspired. At the same time, rural students see more changes in their world, such as fewer employment and recreational opportunities and more family members and other people moving away. More students in the rural communities expect to be living outside their home community – and even outside the province – after they complete their schooling. Rural students reported that one of the changes they perceived was that there were fewer teachers in their school, the result of fewer students in the schools rather than cutbacks in funding.

Performance indicators (including school attendance and completion rates, provincial exam grades, and participation in post-secondary school) told us that average rural school grades on provincial exams continued to be below the provincial average in 2002-2003. A lower level of male achievement corresponds to their lower levels of school satisfaction and higher dissatisfaction than their female peers. Nonetheless, the numbers attending post-secondary institutions have risen dramatically in the past two decades and rural youth are no longer significantly behind their urban counterparts, although there is still room for improvement.

Similar cost-cutting restrictions were also operative on the west coast. There, young people told us that, for the most part, their families were doing well when it came to meeting basic needs, but nearly 15 per cent indicated they experienced financial difficulties and employment problems, the latter important because a large percentage of students work for pay.

Given the time children and youth spend in schools, there is an obvious pathway to their health and well-being from the school environment. More than 50 per cent of west coast youth said that often or sometimes they "feel hopeless" or "unhappy, sad, or depressed." This sense of malaise was reinforced by the slightly under 50 per cent who indicated that they had "trouble enjoying themselves." Sadly, a number of coastal youth in B.C. felt that racism is a problem, with almost one-quarter of youth seeing problems of acceptance of people from different ethnic groups.

We also sought crucial information on youth and the problem of tobacco and drug use, which, most youth agreed, was a problem. There may be a link between this and the lack of varied activities for

youth. In addition, many felt there were not enough opportunities to be involved in the community. This makes it hard to get young people to stay in the area, since they feel that their contributions to the community are not valued. Overall, these west coast youth were not strongly optimistic about their futures. That said, we were encouraged to find that, in spite of the major changes in the economic and social life of this community over the past decade, there are signs of adaptation and resilience among the students. As on the east coast, educational achievement has improved substantially, with most youth planning to leave the community after completing high school and the vast majority of them intending to pursue post-secondary education.

Education can operate as a means of developing future skills that will enrich the employment potential of coastal communities, or it can function in such a way as to force out-migration. Such things as education in small-scale entrepreneurship, art and craft skills, hotel management, and the like build on cultural and environmental strengths and would contribute to keeping communities alive. Some programs that the B.C. schools developed drew on already existing skills and interests of the First Nations student population. The customized program, which is "still running and involving non-Native as well as Native kids, brings disparate groups together"; it is "one of those programs that kept kids in school." It is also one that might help to keep young people in their communities in the future, and its success invites a closer examination of "academic success," a concept that is understood all too often only in reference to the dominant culture.

Two other west coast programs for youth groups in school were particularly vulnerable to a combination of socio-economic restructuring and government policies of financial restraint reminiscent of that which Newfoundland and Labrador has been facing since the 1980s. One involves alternate learning and the other, special needs. Through programs like this, many youth have gained confidence from people who expect them to succeed, have achieved an awareness of their earlier problems, and have gained a sense of personal satisfaction that makes productive citizenship possible. Such programs alone will not promote an active involvement in citizenship or create community leaders, but they demonstrate the way ahead and show that such youth can help others on a one-to-one level. That is a direct pathway to mental well-being.

As the economic situation of coastal communities worsens and increasing numbers of students and their families fall into poverty, the effort to focus attention on student needs becomes increasingly

urgent (Maxwell, 2003). Unfortunately, with increasing class numbers and fewer support workers assigned to classes and community liaison, the opposite scenario is developing in some areas, and mental health and well-being, not just for youth but also for those who care for them in and outside the home, are suffering in the process. As supports are withdrawn, teachers face a greatly increased workload; students, in turn, receive far less attention and help than in previous times. Teachers, and thus youth, are also affected by the recent emphasis on accountability. We saw many innovative school programs for youth, in which issues of personnel, workloads, and budgets combine to present serious challenges to schools, especially to special services such as working with special-needs students and outreach to the community of which the school is a part. Indeed, a number of students on both coasts expressed concerns about their academic preparedness, and many suggested that the lack of school resources resulting from reduced enrolments was a key reason why they were not receiving the education they felt was necessary.

Given the similarity of educational issues on both coasts, we sought to understand the attitudes, desires, and actions that fuelled what we consider to be two related pathways to the health of youth: (1) the impacts of social and environmental restructuring on health, life, and work, as well as on development and planning for coastal youth, for which we interviewed people in five communities on the west coast; and (2) the impacts of that restructuring on the health of youth, using a northern Newfoundland community for our case study. Our results from both coasts have proved to be sufficiently consistent that we are confident that we are addressing national (systemic) problems and potentials. Where there are coastal differences, we indicate them.

In coastal communities, health is related to a number of complex and interacting factors. For young people on both coasts, their major concern is social and emotional health, although "place" (landscape, nature) is also important. Peer and family relationships, as well as schooling and education, are major contributors to youth well-being and are closely linked to overall family and community health, especially in smaller, remote communities where access to services is limited. It is clear that restructuring of all kinds has influenced the emotional and mental health of youth, often in conjunction with their social health or their relationships with family and friends. Negative social relations are often closely connected to poor emotional and mental health in youth, and can jeopardize both their short-term and long-term health.

The pathways between these health issues and young people are direct. On the west coast, they saw economic difficulties as linked to marital separations, divorce, estrangement from or fights with parents, illness, and substance abuse. On both coasts, youth spoke of lack of services and youth-centred resources further affecting their daily lives. They expressed great uncertainty about their future because decisions about what they do, and where they might live in the years ahead, are closely tied to the social and economic conditions in their communities.

However, a major theme that came through strongly in all our interviews was that attachment to place among youth was strong on both coasts. Attachment to community, rooted in part in love of the rural landscape, affords a sense of security and freedom that many youth feel they would not have in an urban setting. Nonetheless, they clearly recognize that urban settings present more educational and employment opportunities and, indeed, in Newfoundland many of the youth we spoke to feel that they are being "pushed" out of the community because of the uncertainty about the future of the community and lack of employment options. Young people with a strong attachment to the place and the culture of the Northern Peninsula appear to be under tremendous pressure to reformulate a new sense of self and identity as they attempt to start a new life elsewhere. Not only did some of the students express concerns about the quality of their current education given the changing context within their community, but some suggested that even though they are preparing for college or university it was uncertain how many would actually complete a degree because of the economic costs of attending university.

Two interrelated themes have emerged from our interviews with youth on both coasts – "uncertainty" and "mobility." The young people's discussions of their current educational and work experiences centred on issues of uncertainty regarding their preparedness – academically, socially, emotionally, and financially – for post-secondary education. They were unsure of the future and what it would hold for them. The issue of mobility was a second major theme. The mobility of teachers and others within the community was one element affecting the quality of their education, as we have seen. The students' discussions about their future job and career opportunities also centred on the mobility that was certain to be a part of their own futures – mobility related to pursuing their education in order to obtain future employment, and mobility related to obtaining employment of any kind.

Consistently recurring major themes on both coasts, then, include: (1) staying in the community versus leaving it; (2) the implementation of "possible selves"; and (3) cultural identity and self-awareness. The health and well-being of these youth are affected by what is presently available to them and their assessment of how current opportunities stack up against opportunities for youth in other places. Many of the youth love their home communities and the relatively unpolluted environment. This strong local tie has both problematic and positive aspects. Some participants are aware that these very ties to their communities limit the choices available to them. They are struggling with whether to focus on staying or leaving. The focus needs to be on generating alternatives, keeping options open, and offering practical support with educational planning, work experience, and economic management. In spite of the positives associated with the close relationship to the physical environment, many youth commented on the lack of options provided in communities that are under transformation. There is no doubt that excessive alcohol and drug use is a major health risk for young people, in part because it is associated with other high-risk activities, including drinking and driving and unsafe sex. Youth are generally very aware of the risks and benefits attached to health and lifestyle choices. They know the importance of nutrition and fitness and the risks that accompany alcohol, tobacco, and substance abuse. Some youth are very aware of and interested in environmental and community "health." By highlighting the importance of the natural or physical environment and the interplay between the social and the physical or natural worlds, this work has opened up and pointed to a new direction for much of the research on youth and health, and sets the stage for more integrated and inclusive frameworks for future health research.

POLICY IMPLICATIONS

In the current climate of economic uncertainty and socio-political restructuring, it is vitally important that young people participate actively in life-career planning. The situation is particularly urgent in communities on both coasts, which have been devastated by recent fishing, forestry, and mining closures. These youth face challenges associated with living in areas where there are dramatically changed economic bases, limited work experience options, high unemployment, isolation, and other factors limiting their knowledge of and exposure to the world of work. In addition, young people in families and communities experiencing stress related to social and economic restructuring are at high risk for injuries and

health problems. Substance abuse, peer violence, depression, and high-risk sexual practices are behaviours associated with the effects of societal restructuring and the resultant family stress, economic hardship, and reduced community services. Communities and families are deeply concerned about the diminishing educational and work opportunities available for their children.

Our findings have several implications for policy and practice in mental health services, education, and community development. From the individual and focus group interviews and the descriptions of supports, issues, and challenges in life and career planning we were offered, several themes and sub-themes emerged. There are limited and decreasing opportunities, information, and contacts related to work or career development and planning – most youth expect they will have to leave to pursue work and/or further education. Not surprisingly, then, youth feel disregarded or "disenfranchised" in the decision-making process. We need to be aware of the cultural and gender role differences that exist among youth with respect to expectations for life and work choices. We also need to be aware of the strong relationships and feelings of attachment to the community and the people in it that most youth (First Nations and others) feel, but most First Nations youth demonstrate a strong cultural identity that goes beyond affection for place and is rooted in a sense of heritage stretching back thousands of years. Mentoring and role models are vital for teenagers as important sources of help and support, but the consequent stress on families, teachers, and community professionals is evident under conditions of diminishing population and resources.

Although the discussions with the youth revealed that they felt very uncertain about their academic readiness and about their futures – where they might work and live and for how long – the students were certain that they needed to work. Many indicated that they were not going to "sit around and do nothing" or they were not going to go on welfare. Some were somewhat hopeful that forestry and fishing would be renewed and that other industries – including tourism – would grow, and that there would be spinoff effects for the community in terms of younger people working and living in the community. Other students were less than optimistic about the future of the community and suggested that in the future it would simply be "a community of old people."

The implications of mobility for the youth are numerous. As many of the youth noted, it is expensive to constantly have to move and to come back and forth to the community. These economic issues may affect the youth's ability to "get ahead" economically in the

future. In addition, there are potentially some very serious emotional and health-related issues connected to this mobility, especially involving attachments to family and friends and the social supports that are important for health and well-being. As we have seen, these challenges to family connection appear to have put First Nations youth at particular risk. It is vital that we address these issues of uncertainty and mobility when generating solutions to the effects of restructuring in coastal Canada.

Finally, youth themselves are aware that they live in uncertain times and are ambivalent about how to deal with this. Some simply have decided to leave for a better chance elsewhere; others hope against hope that things will improve and they will be able to live in the places they deeply love. First Nations youth, despite long-standing problems, have an enormous commitment to place, and some government resources now being targeted at First Nations may help them, but they are struggling, not knowing how to cope and whether to go or stay. For those who want to leave, we need to understand that dislocation will have dangerous effects if the transition is not well managed. For those who wish to stay, and they are the majority, these young people, and the places they live in and are devoted to, constitute an enormous strength for the future if the wherewithal to help them, and to help the communities they love, can be found. We do not think Canada can afford to write off its coastal communities. It is time, therefore, to address the challenges that the youth of coastal communities face, and that Canadians need to face with them.

New Options 6

We examined four possible future options, as a sample of what is being considered: (1) aquaculture, (2) tourism, (3) transportation, and (4) a few local initiatives.

AQUACULTURE AND ENHANCEMENT

In the post-industrial twenty-first century, new opportunities tend to be sought either in the service sector or in transformations of old resource-based industries into putatively more advanced forms of those industries, involving some kind of primary manufacturing. The production of hatchery fish for release in the wild, farmed fish, or the protection of very young wild fish are major initiatives of this kind and are spoken of by government as akin to development beyond primitive hunter-gatherer techniques into those of agriculture. Governments also argue for other strengths, such as producing stable jobs with good opportunities for advancement, and for the subsequent "products" of these new endeavours as being useful substitutes in the marketplace for now-endangered or commercially extinct stocks. On both coasts, then, enhancement and aquaculture have understandably become very popular with federal and provincial governments. There are, however, warnings of potential difficulties that require government attention and arm's-length scientific testing. We summarize them here and point to our main publications for the broader discussion and scientific evidence we produced, which is genuinely arm's-length, having been funded neither by industry nor by government-backed departmental funding.

By the 1970s it had become apparent that salmonid stocks were in peril and in 1977 the Department of Fisheries and Oceans initiated the Salmonid Enhancement Program (SEP). Hatcheries were built to attempt to strengthen stocks by effectively short-circuiting the natural losses that occur between when the eggs are laid (spawning) and when the fish head out to sea (smolt migration). However, the survival rates from smolt release to spawner return re-

main consistently lower than that of wild salmon, and we were unable to solve the problem. In short, hatcheries have not yet proven their value.

Turning to aquaculture, we start from the position that it is not a novel idea. On the west coast, for example, aquaculture is not new, even though the sector may be, since coastal Aboriginal peoples intensified their production of salmon, various kinds of shellfish, and seaweed through enhancing the reproduction and productivity of these resources, as well as through innovations in processing and storing them for year-round use and trade. Productivity was enhanced through maintenance and improvements in the flow and quality of salmon spawning streams and beds, through transplanting salmon eggs from one stream system to another, and through use of fish weirs, which not only helped to harvest fish but also to monitor them and ensure that enough passed upriver to reproduce. Clam "gardening" (see Woods, 2005) was another practice developed in some areas, probably thousands of years ago, which increased the numbers and productivity of butter clams and other species. Intensification of plant products included selective harvesting, transplanting, weeding, clearing, pruning, and in some cases fertilizing. In effect, First Nations "farmed" the sea – a process of primary manufacturing, as is agriculture – and did not just pursue primary extraction. Management was linked to ownership and stewardship patterns that enabled individual families, clans, and lineages to maintain constant control over production and to reap the benefits of their labours directly. It was also focused on local indigenous species, not on exotics, and the managed areas were in situ. These are important conditions of the long-term success of First Nations in aquaculture.

Today, west coast salmon aquaculture plays an important role in the local economy, providing employment to residents both on fish farms and in processing facilities owned by aquaculture companies, and some people are hopeful that this industry will expand to provide more employment. However, modern aquaculture has markedly changed the "ecological footprint" of the industry in coastal B.C. In parallel with DFO's Salmon Enhancement Program, no less than five federal government departments and eight provincial ministries have been involved in regulating and guiding the development of British Columbia's aquaculture industry since 1972. By 1985, the B.C. industry was made up of 100 small businesses; today, the B.C. Salmon Farmers Association represents 11 producers, of which five multinationals control 81 per cent of production. Prior to the Norwegian-sponsored restructuring of the

industry, B.C. salmon farmers were in the business of raising and selling Pacific stocks, specifically chinook and coho. Today, Atlantic salmon is the favoured species for aquaculture in B.C. (82 per cent of production). It is B.C.'s most valued legal agricultural export crop, with wholesale returns three times that of the entire Pacific salmon capture fishery. Farms earn 89 per cent of the wholesale value of their product while fishers only realize 15 per cent.

On the east coast, Atlantic salmon aquaculture has been practised since the 1980s in coastal Newfoundland and New Brunswick. Atlantic salmon continue to be the major product of the aquaculture industry on both coasts, although bivalve aquaculture has been growing rapidly and in Newfoundland there are now considerable efforts towards commercialization of cod aquaculture. Blue mussel aquaculture has been the most successful of the cultured shellfish, but since the 1980s the Newfoundland government has encouraged scallop aquaculture development due to the ready market for scallops in the U.S. The techniques currently used for salmon and cod aquaculture grew out of methods designed to optimize use of precious resources or attempts to reverse their depletion.

The private economic benefits of aquaculture are therefore obvious, while the industry's externalities or hidden costs are rarely discussed. Externalities include government subsidies (job training, infrastructure grants) and nature's subsidies. Ecological costs include but are not limited to: genetic implications of escaped Atlantic salmon in British Columbia waters; the potential for disease and parasite transfer to and from wild salmon stocks; development of antibiotic-resistant pathogens; organic pollution from uneaten food and feces (which can lead to diminished ecosystem functioning); questionable methods of predator (marine mammals and birds) deterrence; and unsustainable extraction of marine protein raw materials, leading to depletion of fish stocks used as fish feed.

TOURISM

One of the biggest hopes for the future on both coasts has been the development of tourism. We point to the example of Tofino on the west coast of Vancouver Island where the economic outlook is relatively positive. There is no doubt that Tofino is experiencing substantial growth in tourism-related employment in accommodation, food, and beverage services. Employment in the tourism industry in Tofino has risen from 190 in 1996 to 305 in 2001, an increase of over 60 per cent. While the tourism sector is now fundamental to Tofino's economy, some feel that the community is overly reliant on tourism, while others believe Tofino's economic

success is rooted in economic diversification. More broadly, people on both coasts have started to think in terms of a range of opportunities that, taken together, provide some hope. They argue that through new Internet-based businesses and tourism ventures, in combination with forestry-and fishery-related work, their economic outlook could be bright.

There are downsides here, too, of course. Many of the jobs associated with traditional resource-based industries often paid better than tourism; they also used to guarantee seasonal employment and a sense of security and stability to workers prior to restructuring in the 1980s.

The relatively remote location of many communities makes them jump-off points from which to gain access to wilderness areas, wildlife viewing, and sport fishing. Such opportunities are something of a double-edged sword, however. The remoteness of many communities has served to protect their culture while making it difficult to get a significant volume of tourist traffic. Finally, the persistence of limited access to trade and professional training has restricted the capacity to diversify into the hospitality and cultural industries. On the east coast (the Great Northern Peninsula's Viking Trail and Gros Morne Park and in southern Labrador) we found similar kinds of development and similar concerns. In most places we were told, "tourism can't replace the fishery" as owners and employees struggle with a short season and low earnings. As one person said, employment in tourism is "OK for a second income or students" but won't keep young people from moving away. Others emphasized that tourism can only succeed if the other sectors do also, as it will be local business that will maintain the restaurants and bed-and-breakfast operations in the off-season.

That said, the manner in which the Haida and Parks Canada operate the National Park Reserve of Gwaii Haanas in Haida Gwaii (Queen Charlotte Islands) is an object lesson in what can be done. There, Haida "watchmen" (often local Haida youth together with older people) reside in the abandoned First Nation villages in the area and teach visitors about the local culture. The park limits the impact of tourism on the fragile ecosystems within it by limiting the number of visitors at any one time and requiring them to take wilderness instruction from park officials before entering the area. The park is run by an effective partnership between the Haida Nation and Parks Canada and could well serve as a model of what can be achieved, given goodwill and intelligent forethought.

TRANSPORTATION: A CASE STUDY FROM LABRADOR

For industrial diversification including tourism development to succeed, appropriate infrastructure is required. On the west coast, road and ferry services connect most of the communities we studied, but on the east coast, until very recently, no road linked the Labrador communities from Red Bay to the regional centre in Goose Bay. Although it is too early to provide a full critical assessment of the impact of the road, we note certain trends. Shellfish products are now largely trucked from the area, while processing plants can now truck in the essential inputs for the production process. Whether or not the road will be the hoped-for catalyst for development remains uncertain, depending to some degree on what is expected of future "development." For some, including government, development is synonymous with economic growth and the exploitation of new resources. For others, real development means the enhancement of people's capacity, within the bounds of a given geography, to have greater control over their lives.

So far, the hurried construction of the new road has squandered the opportunity to develop the kind of infrastructure and expertise in the region that will be needed in the long-term maintenance of the road. There is no doubt that the environmental impact of road construction has been severe and negative. We found that 45 of the 47 culverts were not embedded with natural stream substrate with the minimum of 30 cm, as stipulated in the Department of Fisheries and Oceans fish-stream crossing guidelines, and many presented barriers to fish movements, resulting in fragmentation of stream habitat and loss of spawning and rearing habitat. We explored the economic obstacles to proper culvert installation and concluded that the most common and cost-effective conduits in road construction are the round 800-900 millimetre culverts, which cost about $200 per metre (or about $4,000 for the average stream crossing). The province, with its limited budget, funded the culverts and understandably required bottomless arches or bridges to maintain the original stream bed only when DFO insisted. As a result of our work on culverts, a partnership with the Labrador Métis Nation (LMN) was formed and led to high-level meetings with DFO, which undertook further studies. Five problematic culverts were reinstalled in 2003, the designs for stream crossings of Phase III of the Trans-Labrador Highway were changed in some instances, and LMN fishery guardians have been trained to ensure correct installations.

LOCAL INITIATIVES

It is imperative that governments break the old mindset of single-industry growth as a solution to the survival of coastal communities. Coastal communities need to get away from dependence on just one sector. Diversification is essential if flexibility is to be achieved, and coastal residents certainly understand this and that integrated planning between developing sectors is essential to long-term social-ecological health. We selected a few of these local initiatives, to illustrate the richness and creativity that exists in these places and to support them as they build new strategies that work at an appropriate scale and out of a deep understanding of local social and ecological conditions.

Community adjustment strategies have included attempts to get more involved in fisheries management and stewardship. Efforts have had some success but are limited by a number of barriers, particularly relations with government (e.g., DFO) but also limitations in community capacity, finances, and ability to work together within the community/region. However, "a demonstrated sense of resource stewardship, commitment to an identified geographic area, a core of dedicated individuals with invaluable local knowledge, and organizational experience in fisheries projects . . . represent a foundation to build upon" (Vodden, 2002).

It is well recognized that inter-sectoral collaboration is essential if we are to promote the social and economic health of our rural and remote communities. Such collaboration appears to be alive and well at the community level in Port Hope Simpson: many local agencies have worked to support the Moulder of Dreams pottery workshop, which, over the past seven years, has provided a vocational opportunity for members of the community who suffer from myotonic dystrophy. If such collaboration is lacking at the level of government, however, projects of this kind face enormous obstacles. Small businesses in relatively remote areas are hard to get going; those that also carry a labour force that suffers from a disability are even more difficult to develop to the point of self-sustenance. Primary health care and health promotion cannot be separated from employment generation and rural development initiatives if we are actually to achieve greater equity and to promote the resilience of our rural and remote communities. Moulder of Dreams is a perfect example of the kind of project that has the capacity to promote health *and* the economy in this and other communities.

POLICY IMPLICATIONS

Aquaculture

The ultimate message is that the ecological issues facing industrial salmon farming (as in most extractive industries) are physical manifestations that parallel underlying social imbalances. To focus solely on the ecological issues is to treat the symptoms and ignore the disease. Invariably, contemporary coastal communities today have welcomed aquaculture development initially, but in recent years it has had a very bad press on the west coast as the industry profile changed from large numbers of small-scale, horizontally integrated independent local producers to fewer vertically integrated multinational companies. Unlike the sustainable aquaculture of First Nations or that of earlier small-scale producers, such as in the cod farming based on the traditional east coast trap fishery, the current sector is being developed along the lines of international agribusiness, with efforts intensifying to reach major economies of scale. The aquaculture industry is now a powerful agribusiness with formidable lobbying power commanding a significant presence in government policy development. There is real fear on the west coast that aquaculture development will lead to loss of access by local people to their usual fishing grounds; there are also concerns over pollution and damage to wild stocks.

Government need not abandon aquaculture, but should not fall into the old trap of going too fast and with inadequate understanding of what is happening in order to solve local employment issues quickly. More arm's-length science is needed before some aquaculture can be deemed safe – or otherwise. Moreover, the "agricultural" model that government is following is not necessarily the best one. It is essentially an agribusiness model, used for migratory species about which we do not know enough and in which economies of scale have been raised to the global level before our technologies are sufficiently developed to be environmentally secure and before the products of this model have been ascertained to be safe for human consumption. Smaller-scale agriculture may well be more effective, efficient, and safe, providing local employment and local learning. First Nations have proven this model to be environmentally safe and workable over the long term.

Tourism

Tourism provides service-based employment, which is a weak way to diversify local economies because it is tied to short-term seasonal

projects that depend on market conditions and the weather and because its desirability can be questionable given ongoing problems with environmental and wildlife protection. On both coasts, tourism-related employment is also problematic, at least in isolation, since it is generally very low paid and the season is short. Indeed, on both coasts, tourism operators often have trouble finding workers, even while unemployment rates remain high, and labour shortages continue to be exacerbated by EI rules.

As tourism takes hold on both coasts, there are concerted efforts to "sell" the beauty and history of these places both nationally and internationally. This is reminiscent of Whitson (2001), who has written about the rise of "consumerism" in rural and remote locations, noting that business groups from urban Canada and other countries have turned their eyes to rural communities that can provide world-class recreation and tourism destinations. The resulting gentrification of the rural countryside is often seen as leading to a lack of affordable housing for local residents, with municipal services aimed at supporting affluent newcomers while local young people struggle to make ends meet in low-paying service jobs. Finally, tourism is an industry that can, unless very carefully handled, self-destruct. There is a troubling lack of ecological concern in terms of protecting the beauty that has brought tourists to these areas in the first place. As things stand on both coasts, tourism is seen as a necessary but not sufficient condition of ongoing community resilience. It has the advantages of significant degrees of local control, but the disadvantages of short-term employment and the instability consequent upon seasonality and consumer tastes.

Coastal community residents on both coasts are aware that tourism can only be a complement or supplement, not an alternative, to traditional resource employment, since it alone cannot sustain families and communities. Many people voice concern about the quality of available tourism employment opportunities, and several west coast interviewees explained that such jobs, being seasonal and mostly low-paying, are not ideal for people raising a family or trying to buy a house. On both coasts it is becoming very clear that some services that tourists use in the summer (hotels, restaurants) depend for their long-term viability on year-round business traffic. It is also clear that visitors wish to see living communities and culture, not a place that has become a theme park or that has returned to "wilderness."

Transportation

While initiatives like the Trans-Labrador Highway are essential in this day and age, it is important to consider their human and environmental costs. Misalignment in the form of environmental risks to fish habitat need not have happened if due caution had been observed, and such damage is likely to have negative impacts on tourism. It is also important to maintain consistent policies towards all transportation services in this, as in any, remote area.

Local Initiatives

With sustained and adequate government support to supplement the enormous volunteer contribution from the larger community, Moulder of Dreams, described above, is a good example of a local initiative that has the potential to become a model for other communities, particularly those in rural and remote areas, that are grappling not only with major structural changes in their economies and with out-migration of youth and young families, but also with aging populations and high rates of disability. Sadly, in 2005, the funding for Moulder of Dreams had been – at least temporarily – discontinued, and we hope to hear soon that enhanced and sustained funding and support will be forthcoming. Projects like Moulder of Dreams are important models that should be supported and talked about with pride at the national level, because they have the potential to play a central role in Canada's efforts to reduce health and employment inequalities between rural and urban areas and to enhance primary health care and health promotion across the country. They are worth supporting, and they are worth boasting about.

Overall, we found many examples of creative thinkers out there in coastal communities and many good examples of resilience that governing bodies at all levels could draw upon to promote reconstruction and stewardship of resources, local environments, ecosystems, and social systems: in short, social-ecological health. At the same time, we have identified a real danger that governance structures will do more to hinder than help: there are serious misalignments of approach, with government thinking more along traditional resource-based industrial multinational capital lines in the hope of quick fixes and spectacular statistics. This kind of thinking demonstrably does not work. There must be joint understanding and agreement by coastal communities and governments on what development paths are appropriate, what supports have to be in place, and what pitfalls can be expected. So long as opportunities

are heading in the right direction, it is wise for communities and their governments to hasten slowly.

In the past, restructuring led to the destruction of a functioning social-ecological relationship on both coasts among people, their local environments, and their economies. In the future, the only certainty is more change. It is therefore incumbent upon us, as stewards of our environments and our communities, to make sure that change, when it comes, is for the better. For example, seasonality used to be a strength, and there is no good reason that this should not also be the case in the future, provided that any future interactive restructuring recognizes the potential for positive links that can be established between seasonal pursuits and economic and ecological diversity. This kind of interaction was once the way coastal peoples lived and their communities flourished, and it needs to be recaptured in modern terms as we seek recovery of ecosystems, communities, and the interactions between them that can promote the health of society and the environment. Examples of co-management, such as we saw for Gwaii Haanas, are worth implementing elsewhere.

Transportation infrastructures can enhance or damage (perhaps even destroy) the social-ecological balance of a region: it is up to us. Tourism may, with infrastructural support and residentiary discrimination (that is, if its footprint is not too great and not too damaging), provide a decent livelihood for some and pleasure for countless visitors. Aquaculture and enhancement of the current damaged marine ecosystem can be made to serve all of us well, rather than to damage ecosystems and generate further economic inequalities in a local area. New opportunities in coastal communities are needed, and welcome, but they must be wise.

New Modes of Governance in the Coastal Zone 7

MARINE GOVERNANCE

Management of resources needs to be genuinely social-ecological, which means that to manage a resource we need to manage the actions of its top predators – humans. By extension, we also must seek to match governance practice to ecosystem function and the lives and life cycles of people and communities. Thus, to target only individuals, rather than households and communities, is to produce serious unintended consequences and to fail to address the fundamental issue of community survival. Given the problem of resource degradation currently confronting Canada's coasts, resource management must be for recovery, not for sustaining the present misery. It is unclear to what extent actual recovery is possible but, given the global state of many resources, taking this as our goal is appropriate not only on Canada's coasts but also globally. Global competition has increased the need for flexibility in resource-extraction firms, but such firms have achieved this, unfortunately, by effectively reducing options (and hence flexibility) for people at lower levels of the state system – one such example is the practice of contracting out, which leaves firms flexible but workers insecure. This is particularly problematic for communities that rely on seasonal employment strategies because, over a long history and up until very recently, they could always rely on having the flexibility that allowed them both to survive and to make seasonality a strategic strength.

It seems that such problems have existed in government management of marine resources. Today, similar problems of high-level flexibility in finance, labour management, infrastructure adjustments, interpretation of regulations, and issues of accountability and transparency have proliferated in our governance structures at federal, provincial, and municipal scales, and the result has been a

reduction in flexibility further down the system. This can have serious unforeseen consequences. For example, the hierarchical and rigid procedures of the former DFO regime resulted in a series of governance actions that, paradoxically, drove the groundfish fisheries to commercial and near-biological extinction. With this example before us, we examined new oceans management policies, focusing on the issue of species at risk and the problems and potentials of Marine Protected Areas (MPAs) as one possible approach to conservation. These different approaches are all-important tools in ecosystem conservation and fisheries management for the future, and should be thought of as complementary to one another.

Canada's Oceans Act and associated documents purport to lay out a strategy for the future management of Canada's oceans. It is important that the Canadian state maintains its overall responsibility for management and not effectively hand it over to particular groups of vested interests as some quota management schemes have done in the past. The resulting social-ecological patchwork management and recovery approach this can produce is unlikely to ensure sustainable management, let alone recovery. At the same time, monolithic, centralized management based on single-species assessments and policies with inappropriate spatial and temporal management scales also don't work. We could begin to achieve an even-handed, multi-layered, and effective Integrated Management regime if the following strategies were pursued:

- attention to habitats, species interactions, and ecology;
- investing in recovery rather than sustaining misery;
- developing the social and economic structures needed for effective co-management;
- strategic identification, development, monitoring, and ongoing adjustment of spatially and temporally appropriate management initiatives;
- managing for multiple generations of people and fish, with careful attention paid to the question of recovery *for whom* and a goal of promoting the health of people, communities, and environments.

This will happen if, and only if, there is genuine and equitable representation for stakeholders from all levels of interest and if shared goals go beyond the purely short-term environmental, social, political, or economic points of view. Thus, the goals of conservation, stewardship, ecosystem health, human health, and community health, as well as scientific and technological imperatives and security concerns, all need to be interwoven together.

We can use both the knowledge of species-at-risk hot spots and the protective practices of MPAs in the short run, while preparing in the long run to provide a highly flexible method of restoring lost ecosystems based on the informed choice of stakeholders. In all discussions, issues of access, ownership, and food security for humans will also need to be considered. Managing Canada's oceans means managing the actions of Canadian users of the oceans. For this to be effective, it is important that managers understand the goals and interests of various stakeholders and also have a firm grasp of the scientific knowledge of the ecosystems involved, including different forms of knowledge and an awareness of crucial gaps in that knowledge that can seriously affect stock assessment. Managing all of this will involve bringing together the various levels of interests involved so that they can work together, discussing and negotiating their differences. Only then can the integrity of marine ecosystems be at lesser risk of damage, and only then can managers ensure that the risks and costs of using Canada's oceans are not paid by one set of stakeholders while the benefits accrue to another.

Canada's Oceans Act and associated strategies signal growing institutional awareness of the problems of disturbed ecosystems, but much less awareness of the social complexities involved, which cannot be considered separately from new forms of ocean and coastal management. New initiatives will have to consider social health and ecological health in tandem, as interactively related phenomena, which we refer to as social-ecological health (Dolan et al., 2005), and will therefore have to use co-management structures of some form. In Ommer and Team (forthcoming), we have discussed all of these features and identified strengths and weaknesses of the suggested strategies for the future. The summary of approaches we offer here provides ways to evaluate what is "in play," when we recognize that there are rich flows of benefits – spiritual, cultural, ecosystem service, social, ecological, and economic – from healthy coastal ecosystems (for more detail, see also Vodden, forthcoming). When we compare these potential benefits with the cost to future generations of non-sustainable activities, it becomes obvious that whatever we do must not compromise the productive and regenerative capacities of marine ecosystems in and for the future. Meanwhile, current management practices – often based on the perceived inevitability of the fiscal imperatives justified in conventional discounting – ensure that we continue to deplete marine ecosystems. At the same time, such practices and the costs they entail will preclude the level of reinvestment in natural and social capital needed to compensate for the past 150 years of overharvesting.

GOVERNANCE IN THE COASTAL ZONE

In this last section, we turn to the challenges of landward management and of the land/sea interface. Some management examples now being tested in different parts of coastal Canada illustrate the challenges in this domain.

We looked at some of the resource management options that coastal communities have considered as they seek to come to grips with the changing socio-economic, environmental, and political conditions that have affected their terrestrial and land/water interface ecosystems. Interactive restructuring has occurred at all levels and on multiple dimensions and it is now the case that, at the national level, this restructuring is being driven to a significant extent by various changes in markets and economies at the global level. While international restructuring is beyond the scope of our study, we need to be constantly aware of its existence and recognize it as part of the driving force behind social-ecological distress, as seen in the over-exploitation of the world's oceans and the destruction of the Amazon tropical rain forest, for example. This restructuring and the damage it has caused have been driven by the industrial and fiduciary agendas of transnational actors – transnational corporations, banks, and their various instruments, such as the International Monetary Fund and the World Trade Organization (WTO). There is little in the way of transnational governance institutional capacity or autonomy that can offset the economic agendas of the large banks and corporations. The United Nations and transnational non-governmental organizations (NGOs) are without the necessary instruments of adjustment with which to alter any concerted global economic developments, and structures like the WTO are essentially under the influence of the developed nations and the major corporations that these countries often serve. Particularly since the early 1970s, national governments have become increasingly sensitive to the requirements and needs of the global economy, and much of their political-economic strategy now falls within the rubric of a global competitive business trajectory.

Canadian policy restructuring has affected our study areas in several ways, interacting with industrial, environmental, and social restructuring. Nationally, in the context of deficit fighting and an ethos of increased reliance on the private sector (both driven by the requirements of globalization), we have seen that policies that traditionally supported rural economies and communities – including, for example, federal-provincial transfer payments, rural development initiatives, and unemployment insurance – have been significantly

eroded. Regional economic development programs have been replaced by community economic development and by sub-provincial rather than multi-province "regional" initiatives. The result is that struggling communities are left to find their own solutions. While often seeking to be part of the problem-solving process, they also have to deal with depleted resources, cutbacks in essential transportation services, and market shifts that, taken together, have combined to undermine rural communities and industries, as we have shown in detail in our overview volume (Ommer and Team, forthcoming) and other publications. Political restructuring has reconfigured welfare state entitlements to benefits, such as EI, social assistance, and workers' compensation, and to services, such as health care and education. While health-care restructuring has sometimes increased the range of services available in rural areas, centralization and escalation of user fees for health services have hurt many communities. In practice, most of the restructuring in the governance of health care has been influenced more by the biomedical model than by social determinants or ecological health. Consolidation of education has been an ongoing concern in rural communities.

There has also been significant deregulation and re-regulation of resource access. The traditional resource sectors of forestry and fishing have both been reconfigured through new efforts to change the rules affecting resource access in such a way as to privilege corporate over community interests, often in the name of resource sustainability. In fisheries, licensing costs, privatization of public infrastructure like wharves and catch monitoring, professionalization programs, and the spread of individual quotas and individual transferable quotas are limiting access, driving up the cost of entry into the industry, and facilitating the concentration of ownership and control over the resource and the industry as a whole. In both fisheries and forestry there are competing interests between sectors (e.g., inshore, offshore, subsistence; pulp, sawmills) and between large companies and smaller operators, which come into play in terms of resource management. Such changes in resource policies both shape and are influenced by industrial and environmental restructuring. In turn, the households that are trying to make a living in the resource sectors have had to adjust to a new set of constraints and rigidities, although there are also a few new opportunities. Communities prosper or decline in the process.

Clearly, the top-down model of governance has failed coastal and other rural communities and needs to be replaced with something that can operate across scales and beyond policy, academic, and bureaucratic silos. Piecemeal, highly localized programs are not

an appropriate alternative. Some new land-based and coastal governance structures already exist, and their achievements tell us much about which strategies might help to protect coastal social-ecological health in the future. This is where it is important to insist on the need to recognize constraints at all levels, particularly the institutional constraints that can render local-scale innovations impotent. With that in mind, in our in-depth publications, and also in our overview volume, we discuss some models of collaborative governance that are now actually in operation at the regional or subregional level. In our overview volume we include examples within the realms of watershed management, integrated coastal management, regional economic development, and community-university research and education partnerships. We also discuss the crucial issue of the stewardship of local social-ecological systems by local communities, assessing that concept as a foundation for success in collaborative governance arrangements aimed at long-term resilience of coastal social-ecological systems. Throughout all our work, we are enlightened by our empirical findings, and by questions of social-ecological cross-scale and cross-institution interactions in matters of governance.

Conclusion

Final Reflections

New approaches evolve from historical ones and take place within a context that is multi-scalar in temporal and spatial, among other, dimensions. Acknowledging complexity and focusing on collective ways to understand and better manage complex adaptive systems for social-ecological health help to develop the mindset in which connections between system parts and levels are recognized and cultivated. Collaboration is itself an adaptive response for policy-makers, who over the last several years have had to deal with a range of difficult new circumstances. In this conclusion we examine a range of governance models that hold promise for future ways of managing social-ecological systems, coastal and otherwise: regional economic development structures; coastal zone management; university institutional change; and local social-ecological stewardship initiatives that can be integrated into co-management structures. Most of the initiatives that we have identified as helpful and productive are, sadly, either not linked to or else not well supported by existing formal structures. This is deeply troubling because rural development that is not linked to environmental recovery and stewardship, and that does not support a broad co-management model operating across the nested scales from state to community, is, as we have shown throughout our work, problematic. What has become clear in the course of the extensive and intensive research conducted for the "Coasts Under Stress" project is that it is not enough to address integration only in terms of the spatial and ecosystem dimensions of a coastal zone – its marine, terrestrial, freshwater and estuarine, local, regional, and national aspects. It is also vital that intersectoral, intergovernmental, and interdisciplinary aspects are considered. In other words, both the vertical and horizontal, cross-scale and multi-sectoral dimensions of the coastal

social-ecological system must be considered (Ommer and Team, forthcoming; Sorensen, 1997; Meltzer, 1998). This provides the opportunity for leadership at the local level within a national and even international policy framework that provides co-ordination, funding, and administrative support.

The link between regional economic development, Integrated Management, and resource management has yet to be fully developed or established in these models. Greater attention to environment-economy interrelationships and commitment to the concept of resilience are required. Many local institutions, guided by higher-level policies, have pursued the goal of economic diversification, but "new economy" sectors (such as information technology, tourism, and small business development), while critical to diversification and thus to increased resilience and long-term community survival, must be balanced with traditional sectors that form the foundation of community economies, history, and identity. Development in resource sectors necessarily involves attention to intergenerationally sustainable resource management and land use, and requires an incorporation of the stewardship ethic into regional economic development policy and practice.

Clearly, regional economic development institutions (such as Newfoundland and Labrador's Regional Economic Development Boards and British Columbia's Community Futures Development Corporations) must fit the needs of local community economic development organizations and activities, and governments need to pay attention to linkages between scales, clarifying relationships and increasing communication and co-operation, while recognizing financial and human resource realities. Integrated Management should evolve in this direction through a multi-staged multi-scale process in which time and resources are allocated for building capacity (human, technical, financial, legal/administrative) and for creating the cross-scale and cross-sector relationships that will provide a solid foundation for the future of the process. We should be working towards a more balanced and collaborative approach that creates linkages within the divide of bottom-up endogenous development and top-down government-run economic development programs for "disadvantaged" regions. At the same time, we need to identify and seek to remove still existing "silos" that deny the connectedness of society and ecology in social-ecological systems and that ignore the difficulties of local-level change in the midst of higher-level rigidities.

In this respect, "development institutions," both formal and informal, are important vehicles for governance learning. Such

institutions, with appropriate support and appropriate organizational and institutional frameworks, could facilitate the undertaking of increased responsibilities at the local and regional levels and lead to resilience in local social-ecological systems within the greater meta-system (i.e., "panarchy," Gunderson and Holling, 2002) of the state. There needs to be a cross-scale and cross-sector drive to recovery, which is consciously and structurally combined with the promotion of both human health (employment, income, physical and work environments, gender and social equity – all of the health determinants) and health of the environment. Co-operation between provincial and federal actors and other interests such as the private sector and academia is essential here, as are a supportive legislative and policy framework, strong local institutions, and community action and commitment. Also critical are the informal personal relationships that develop through interactions associated with these institutions. These relationships provide the "glue" that ultimately makes these institutions work, building trust, mutual respect, and understanding over time. At the same time, shorter-term concrete achievements, reflection, and learning should be achieved and celebrated along the way.

Significantly, the multiple versions of new organizational structures that exist in Canada speak to the "panarchy" idea that creative experimentation must take place at the lowest (grassroots) level of a complex system for it to be at a small enough scale to be testable and hence adaptive. That creativity then needs to be discussed across scales and adopted at the upper levels when judged appropriate and useful. It is encouraging that this appears to be feasible inside the Canadian federal and provincial systems. With their local focus, regional development institutions exercise significant local influence. They now need to link up (to scales beyond the region), down (to communities within their region), and out (to other regional efforts) in order to be effective and influence broader changes in society that ultimately affect their own efforts. This can be done by encouraging and supporting the continued development of community stewardship and collaborative governance models across the country, utilizing knowledge gained through critical analysis of existing experiences and sharing of lessons learned. Such an approach must be pursued with awareness that "one size does not fit all," that different regions will require different solutions and that not all communities and regions may wish, or have the capacity, to participate. Policies and programs to support local initiatives must be accompanied by realistic evaluations of resource requirements and availability, and

should involve all actors. As well, they need to provide the mental space or freedom for creative solutions to emerge.

The twenty-first-century notion of collaborative governance can be conceptualized as a broader form of co-management, extending beyond the management of ecological resources to a broad cross-section of societal affairs ranging from fisheries management and land-use planning to education and health care. We therefore suggest, based on local and international experience, that Canada adopt 10 key guidelines for integrated coastal management (Vodden et al., 2003):

1. ensure ecosystem health and integrity;
2. assert community rights and leadership, identifying and working through value differences to reach a mutually satisfactory set of goals based on agreed values and underlying principles;
3. recognize Aboriginal rights and title;
4. create and commit to new ways of working together, including merging stewardship and co-management approaches that enshrine the principles of precautionary management and adjacency;
5. determine the appropriate scales for different parts of the planning and management process;
6. set realistic timelines;
7. practise adaptive management that includes identifying and learning to work with and around real constraints at any level of the process;
8. make capacity-building an integral part of the planning process;
9. integrate local and scientific knowledge, include existing information in the process, and strive to fill critical knowledge gaps;
10. recognize and incorporate multiple values and uses.

"Coasts Under Stress" examined coastal issues using a "spotlight" and "searchlight" approach, which let us survey the broad context in which coastal communities developed and survived ("searchlight"), while also employing in-depth case studies ("spotlight") to get at the vital details that uncovered the linkages, pathways, interdependencies, and connectivities involved in the restructuring that coastal communities and environments have faced. Our research modus operandi is also potentially very useful for policy-makers as they seek ways to think and operate "outside the box" in complex situations. We suggest that identifying various kinds of research as either "spotlight" or "searchlight" work will enable policy-makers to use a wide range of research in appropriate ways. Certainly, significant opportunities exist to create and build

upon new networks and institutional models, such as we have discussed in our overview volume, in this time of continuing coastal governance reform. For this to happen, however, we will need, as a nation, to adopt an attitude of open and ongoing examination of innovations, to be free to implement, and if necessary change to suit place and circumstance, any improvements that may occur. This is an adaptive co-management approach to social-ecological health that reflects a commitment to ongoing social learning. The result will be not only a dramatic increase in social-ecological health and coastal community resilience, but also a new leadership role for Canada in the ongoing global striving for coastal community reform.

References

Auditor General of Canada (AGC). 1997. *Fisheries and Oceans Canada: Sustainable Fisheries Framework: Atlantic Groundfish*, chapter 14. At: <www.oag-bvg.gc.ca>.

Clayoquot Sound Scientific Panel. 1995. *First Nations' Perspectives Relating to Forest Practices Standards in Clayoquot Sound.*

Cruikshank, D. 1991. *A Commission of Inquiry into Licensing and Related Policies of the Department of Fisheries and Oceans: The Fisherman's Report.* Vancouver: United Fishermen and Allied Workers' Union.

Dolan, A.H., S.M. Taylor, B. Neis, J. Eyles, R.E. Ommer, D.C. Schneider, and W.A. Montevecchi. 2005. "Restructuring and health in Canadian coastal communities: A social-ecological framework of restructuring and health," *EcoHealth* 2, 3: 195-208. At: <http://dx.doi.org/10.1007/s10393-005-6333-7>.

Ecotrust Canada. 1997. *Seeing the Ocean through the Trees: A Conservation-based Development Strategy for Clayoquot Sound.* Vancouver: Ecotrust Canada.

Ecotrust Canada and Ecotrust. 2004. *Catch-22: Conservation, Communities and the Privatization of BC Fisheries.* Vancouver: Ecotrust Canada.

Gowgaia Institute. 2003. "Haida Gwaii: What's been logged?" *SpruceRoots Magazine.* At: <www.spruceroots.org/Gallery/Logging.html>.

Gunderson, L., and C.S. Holling. 2002. *Panarchy: Understanding Transformations in Human and Natural Systems.* Washington: Island Press.

Howse, D.G., B. Neis, A. Cartier, L. Horth-Susin, M. Jong, and M. Swanson. Forthcoming. "Gender and snow crab occupational asthma in Newfoundland and Labrador, Canada," *Environmental Research.*

Lutz, J., and B. Neis, eds. Forthcoming. *Making and Moving Knowledge.*

Maxwell, L. 2003. "Teachers Speak: Impact of Restructuring on the Daily Lives of Elementary Educators," MA thesis, University of Victoria.

McDonnell, M.J., T. Steward, A. Pickett, P. Groffman, P. Bohlen, R.V. Pouyat, W.C. Zipperer, R.W. Parmelee, M.M. Carreiro, and K. Medley. 1997. "Ecosystem processes along an urban-to-rural gradient," *Urban Ecosystems* 1: 21-36.

Meltzer, E. 1998. *International Review of Integrated Coastal Zone Management: Potential Application to the East and West Coasts of Canada.* Ottawa: Department of Fisheries and Oceans.

Ommer, R.E., and Team. Forthcoming. *Coasts Under Stress: Restructuring and Social-Ecological Health.* Montreal and Kingston: McGill-Queen's University Press.

Pacific Salmon Revitalization Plan Review Panel. 1996. *Tangled Lines: A Federal-Provincial Review of the Mifflin Plan.*

Palmer, C.T., and P.R. Sinclair. 1997. *When the Fish Are Gone: Ecological Disaster and Fishers in Northwest Newfoundland.* Halifax: Fernwood.

Parrish, C.C., N.J. Turner, and S.M. Solberg, eds. Forthcoming. *Resetting the Kitchen Table: Food Security, Culture, Health and Resilience in Coastal Communities.* Hauppauge, N.Y.: Nova Science.

Praxis Research and Consulting. 2005. *Setting a New Course – Phase II, Human Resources Sector Study for the Fish Harvesting Industry in Canada.* Ottawa: Canadian Council of Professional Fish Harvesters.

Prince Rupert Economic Development Commission. 2002. *A Socio-economic Impact Analysis of Skeena Cellulose Inc.* Prince Rupert, B.C.: Prince Rupert Economic Development Commission.

Rajala, R. 2006. *Up-Coast: Forests, People, and Industry on British Columbia's Central and North Coast, 1870-2004.* Victoria: Royal British Columbia Museum and Coasts Under Stress Research Project.

Sinclair, P.R., and R.E. Ommer, eds. 2006. *Power and Restructuring: Shaping Canada's Coastal Society and Environment.* St. John's: ISER Books.

Sorensen, J. 1997. "National and International Efforts at Integrated Coastal Management: Definitions, Achievements, Lessons," *Coastal Management* 25, 1: 3-41.

Statistics Canada. 2001. *Community Profiles.* At: <www.statcan.ca/english/profil101/>.

Vodden, K. 2002. "Sustainable community development in a coastal context: The case of Alert Bay, British Columbia," *Canadian Journal of Aboriginal Economic Development* 3, 1: 58-75.

———. Forthcoming. "Collaborative Governance and the Search for Sustainability in Canada's Coastal Regions," Ph.D. thesis, Simon Fraser University.

———, J. Penikett, and M. Berry. 2003. *Examining Best Practices in Coastal Zone Planning: Lessons and Applications for BC's Central Coast.* Burnaby, B.C.: Simon Fraser University Centre for Coastal Studies. At: <www.sfu.ca/coastalstudies>.

Whitson, D. 2001. "Nature as playground: Recreation and gentrification in the mountain west," in R. Epp and D. Whitson, eds., *Writing Off the Rural West: Globalization, Governments and the Transformation of Rural*

Communities. Edmonton: University of Alberta Press and Parkland Institute, 141-64.

Woods, Diane, producer. 2005. *Ancient Sea Gardens: Mystery of the Pacific Northwest*. AquaCulture Pictures Inc. Narrated by Lorne Cardinal.

Coasts Under Stress:

Restructuring and Social-Ecological Health

Policy Reflections

Rosemary E. Ommer

This material is taken from Rosemary E. Ommer and the Coasts Under Stress research project team, *Coasts Under Stress: Understanding Restructuring and Social-Ecological Health.* Montreal and Kingston: McGill-Queen's University Press, forthcoming 2007.

Reprinted 2009

ISBN: 1-894725-05-0

(Social and Economic Papers; 27)

Published by ISER Books - Faculty of Arts Publications
Institute of Social and Economic Research
Memorial University of Newfoundland
St. John's, NL
A1C 5S7

Printed and bound in Canada

Contents

Preface	5
Introduction: The Problem	7
1 The Fishery: Managing for Scarcity	9
Data Problems	10
Individual Transferable Quotas (ITQs)	15
Conservation, Overharvesting Pressures, and Skepticism in Local Fishing Communities	16
Livelihoods	17
Policy Implications	21
2 Forest Products	25
Livelihoods	28
Policy Implications	30
3 Non-Renewable Resources: Mining; Oil and Gas	34
Policy Implications	36
4 The Impact of Restructuring on People's Health and Lives	39
Livelihoods	43
Employment Insurance/Income Assistance	44
The Informal Economy	44
Diet	45
Uncertainty, Stress, Tensions, and Human Health	46
Policy Implications	47
5 Education and the Future	49
Policy Implications	54
6 New Options	57
Aquaculture and Enhancement	57
Tourism	59
Transportation: A Case Study from Labrador	61
Local Initiatives	62
Policy Implications	63
Aquaculture	63
Tourism	63
Transportation	65

Local Initiatives 65
7 New Modes of Governance in the Coastal Zone 67
Marine Governance 67
Governance in the Coastal Zone 70
Conclusion: Final Reflections 73
References 78

Preface

The results of the work of the "Coasts Under Stress" (CUS) project are to be found in numerous journal articles, two films, two booklets, one book, and four edited collections, showing how the various parts of life in coastal communities fit together and how interactive restructuring has generated the risks, threats, and opportunities that coastal communities (human and biophysical) confront. Three of the team books are theme-based. One is on social-ecological knowledge systems and the vital importance and challenges of moving knowledge across disciplinary boundaries, within and between knowledge systems, and from people to researchers to policy-makers to students and back to communities in order to grapple with interactive restructuring and its effects (Lutz and Neis, submitted). One is on the relationship between interactive restructuring and power, whether as energy (oil and gas, hydro), as "power over nature constructs," or as power and agency in nature and human communities (Sinclair and Ommer, 2006). One is on the history of health, diet, and nutrition – with a particular focus on the issue of decreasing food security in places where once-stable food webs have suffered radical shock, as have the cultures of human communities that have always been interdependent with now-endangered food sources (Parrish, Turner, and Solberg, in press). There are two publications for special audiences: one for coastal communities and this one for policy-makers, which is drawn from the principal team-written volume (Ommer and Team, forthcoming).

In all our work, by *environmental restructuring* we mean alterations to the environment, usually at large scales, which are thought to be caused, at least in part, by such things as climate change. We take *social restructuring* to mean changes in society at a range of scales. These result, for example, in alterations in community cohesion, social support, health-care delivery, and the availability of educational resources. Such changes include industrial restructuring, which deals with shifts in patterns of ownership and control and in work environments, and political restructuring, which deals with shifts in policy regimes. We take *health* to be the capacity to cope with stressors and recognize that people are a part of (not outside) nature. *Social-ecological* health is the capacity of the human-natural

world nexus to deal resiliently with change and the stress that it brings (Dolan et al., 2005).

We wish to take this opportunity to thank the Social Sciences and Humanities Research Council of Canada (SSHRC), the Natural Sciences and Engineering Research Council of Canada (NSERC), Memorial University of Newfoundland, and the University of Victoria for major funding of this work and for ongoing support throughout the lifetime of the project. We owe a debt of gratitude to Yves Mougeot and Katharine Benzekri of SSHRC, along with the various SSHRC officers who assisted us, particularly Jacques Critchley, who got us started, Pierre-François LeFol, who was with us in our "middle period," and Michèle Dupuis, who has seen us through to the end. We also wish to express our gratitude to André Isabelle and Anne Alper of NSERC, whose assistance has likewise been invaluable throughout all the years of our work. This project could not have been carried out without a dedicated staff, and we here thank Janet Oliver, Carrie Holcapek, Cathy King, Kari Marks, Angela Drake, and Moira Wainwright for their hard work, constancy, and continued support through thick and thin. We wish also to thank the other universities whose faculty contributed to our work: The University of British Columbia (and, in particular, the Fisheries Centre and the Department of Geography), Dalhousie University, Saint Mary's University, and the University of New Brunswick. Our heartfelt thanks goes to our partners and our advisory boards, and to the Centre for Studies in Religion and Society and the Centre for Earth and Ocean Research, both at the University of Victoria, for providing the west coast part of the team with a home. On the east coast, Memorial University provided a small building for the use of staff, faculty, and students, while on the west coast the University of Victoria gave the Project Director an academic home. We are grateful to both these institutions for their generosity and for their faith in us.

We wish to thank Richard Tallman for his outstanding and thoughtful copy-editing. Special thanks are also due to Philip Cercone of McGill-Queen's University Press for his kind permission for the publication of this booklet, which is drawn from the main volume of Coasts Under Stress research: *Coasts Under Stress: Restructuring and Social-Ecological Health* (Ommer and Team, forthcoming), a McGill-Queen's University Press publication.

Rosemary E. Ommer
University of Victoria
May 2006

Introduction

The Problem

On our east and west coasts, the resources that once supported communities are now all but gone, and local coastal communities, along with the ecosystems that support them, are in serious trouble. Such a crisis should concern us all, because these places are bellwethers for national and global changes that, scientists are warning us, suggest that we are heading towards some very serious environmental collapse and the social chaos consequent upon that. It is clear that we need new ways of thinking about the highly complex links between social and environmental restructuring. How places and people interact to provide social-ecological health or malaise is only now beginning to be understood by scientists of all kinds, including policy-makers. Some policy suggestions culled from our five-plus years of research on those interactions are the subject of this booklet.

Thinking in terms of "social-ecological health" links people and environment together in new and necessary ways. In our in-depth publications (see www.coastsunderstress.ca) we have demonstrated how resource-sector policies that effect change in human behaviour have consequences that can lead either to social, economic, and environmental improvements (as is their purpose) or to biophysical and social distress, which is what happens when the risks, costs, and benefits promoted by such policies are both misunderstood and misaligned. This is why, despite extensive investments in resource management and environmental impact assessments, for example, we have overharvested our fish and forests, put our known mineral and energy resources under pressure, and degraded our marine, terrestrial, and atmospheric habitats. No wonder coastal communities are increasingly in trouble!

Three kinds of *scale mismatches* are primary culprits in this mess. *Spatial scale* mismatches (asymmetries) occur when activities appropriate to one geographical level are applied without due consideration at another, or when the process is wrong and decisions are made at one level that pertain to another and people at that other level (usually, but not always, lower down) are not consulted. Government policy, for example, may be directed at "the individual," when "the community" is the more appropriate target for some policies. *Temporal scale* mismatches occur when major changes are introduced too fast (or too slow) and problems arise from overly rapid, or insufficiently rapid, change. *Organizational scale* mismatches occur when, for example, activities appropriate at the level of the firm are applied to government or community organizations. Different types of asymmetry tend to go together: decisions made at the wrong level run the risk of not applying at different geographical scales; and they may also not match at the temporal scale, if, for example, they are made from a business perspective and do not apply cross-generationally – always a concern for small communities in general, and First Nations in particular. Among the *sources* of misalignment we have uncovered are misdirected flows of benefits that, if they are too short-term or fail to reach resource-dependent regions and generate diversification in them, can lead to overdependence on one resource and a consequent inability to transform the economy when markets falter or the resource is depleted.

The solution now emerging in government and elsewhere is promising. *Multi-scale governance* allows flows of knowledge and readjustments of regulatory power to occur at and across different levels of organization (local, provincial, regional, industrial, and federal). Given that two very different coasts are suffering in similar ways, it is sensible to assume, as these new initiatives do, that human decision-making is both the cause of and the potential solution to the problem. This is a matter of wise managerial choice, which is urgently needed if we are to avoid further serious problems. As a contribution to ongoing new initiatives at several levels, we offer our analysis, topic by topic, of the various manifestations of the present crisis and how these might be resolved.

The Fishery: Managing for Scarcity 1

On the east coast, Labrador's cod and snow crab stocks are in worse shape than those further south. Things grow more slowly in the cold waters off Labrador, and Labrador is the northern limit of the range of these species. Thus, Labrador is the first place we should look to verify the extent to which we are managing for recovery. Despite relatively elaborate scientific and management infrastructures for fisheries, particularly after the extension of 200-mile EEZs (Exclusive Economic Zones) in the 1970s, many fish stocks reached all-time lows in the 1990s. The collapse of east coast groundfish stocks is now agreed to have been the result of the overfishing of stocks, which were already vulnerable because of changing water temperatures: a social-ecological damage scenario. A series of moratoria were subsequently put in place to allow the stocks to recover, but since then, while deep-water fleets now draw profits from stocks caught elsewhere, local emphasis has turned to alternate species, some of which are now also overfished. In 2006, it was widely acknowledged that the Newfoundland and Labrador fishing industry was in crisis. On the west coast, some salmon stocks are also in danger, quite possibly from overfishing and changing water conditions. While many changes have been made on that coast, with 100 per cent observer coverage in some fisheries and video camera surveillance systems on many vessels, along with fleet reduction measures, closures, and other conservation measures that have begun to affect some stocks positively, serious problems persist for small resource-based communities and the small-boat fishery. The lack of social-ecological analysis and remediation has left many east coast and west coast communities in crisis.

This is just not good enough. The east coast groundfish moratoria could have marked a turning point in Canadian fisheries management, given the general agreement between federal scientists, policy-makers, industry, and local people that there were

serious problems of overharvesting and resource degradation, and that new and more effective approaches to science and management were needed. The opportunity for change remains, but effective conservation measures capable of supporting recovery that also take communities into account have remained elusive in the face of continuing scale misalignments in policy initiatives.

Current management and capture discussions now revolve around the dilemma of how to deal with scarce and vulnerable resources in the face of technological overcapacity, global industrial dynamism, and shifting market forces. At the same time, inadequate funding for science (and hence inadequate science) and associated high levels of uncertainty remain. The misfit of contemporary fishery resources, industrial (corporate and owner-operator) needs, and scientific management capacity is now serious. We see *four scarcity issues* whose resolution will be key to solving the root problems in Canadian fisheries management and practice: (1) data problems that underlie the nature and quality of the information available to fisheries science and collaborating fish harvester organizations for accurate stock assessment, partly as a result of very rapid changes in fishing efficiency and practices; (2) the way in which social and economic power, institutional structures and paradigms, and science and management practice interact; (3) the mismatch between management practices and the way in which the marine biophysical environment is seen to be behaving by local communities; and (4) the problems of people's livelihoods in the face of resource depletion. All of these will have to be dealt with in the context of social-ecological *inter*activity, because management practices continue to shape fish capture and to alter (i.e., restructure) the social-ecological situation in which coastal communities find themselves. In all of the following discussion, we take into account the dilemmas that persist in the fishing industry, but the focus here is primarily on the continuing threat on both coasts to the *small-boat fisheries* that are a crucial (although not the sole) lifeline of coastal communities.

DATA PROBLEMS

In the new ecosystem-based management system recommended by Canada's Oceans Act, fishery quotas remain the principal management tool. The scientific data used to calculate quotas must include accurate knowledge of fishing mortality if they are to be useful. This means that actual discard rates and the species composition of discards must be included in the calculation if managers are to be able to estimate the impact of fishing at the stock, population, trophic,

and ecosystem level. Ecosystem management works best at the *regional* level, which is therefore where we need accurate catch data that reflect the full scope of fishing mortality. However, *accurate catch data are impossible to get.* A major problem here is the existence of "data fouling," which is the result of poor fishing practices such as high-grading, discarding, and under-reporting. We do not know how much data fouling actually exists, and the motivations behind it are hard to establish empirically. Landings data only include the landings of fish that are recorded and make it into the formal marketplace, so species (and sizes) of fish with no commercial value historically do not appear there, nor, until recently, did fish harvested for subsistence purposes and sold locally, some of which is still not recorded. Fishery closures, total allowable catch (TAC) regulations, enterprise allocations, and individual quotas have also encouraged such data-fouling practices as misreporting and concealment of catches, dumping, discarding, and high-grading. The rate of dumping plus discarding, estimated to have been 8.4 per cent for cod in 1985, may have reached significant levels by 1986: one estimate suggested that the inshore fisheries discarded 5 per cent by weight in the early 1980s, increasing to 28 per cent in 1989. The 1997 Auditor General's Report still considered Canada's fish stocks data to be inaccurate, due to under-reporting, misreporting, and/or additional fishing mortality caused by unsustainable fishing practices (AGC, 1997). The fishers we interviewed told us that the misreporting of cod is extremely high since, at time of the study and in that area, there was no "official" quota for cod, and where restricted fisheries were permitted for scientific purposes (the sentinel fishery and an index fishery) some thought that under-reporting by weight and misnaming of species were rampant, with cod being recorded as redfish, turbot, mackerel, herring, and capelin, since these were carted by truckloads and not monitored by boatloads.

We have identified some of the gaps in fisheries science for our study areas of the northern Gulf of St. Lawrence and southern Labrador coast, where cuts to stock assessment science are exacerbated by changes in fisheries' practice and in the location of some fish populations. Lobster, which became very important in many parts of Newfoundland in the 1990s, are subject to extreme pressure in some areas, but in 2003 the scientific resources available to monitor the fishery and to assess stock abundance had not expanded to match the need, while those scientific resources that did exist were disproportionately concentrated in some regions. Similar problems exist with crab and shrimp science, where con-

temporary fishing pressure is also intense and where the science capacity is extremely limited.

On the northeast coast and in Labrador most of the cod that survived the overfishing of the 1980s live in the bays rather than in the offshore areas that were the central focus of stock assessment science in the past. Limited fisheries have reduced access to commercial fisheries data, while efforts to develop new indices of abundance with fewer problems than commercial data (such as sentinel fisheries) are relatively new, provide sparse indices, and are somewhat controversial among harvesters and scientists. Some of the surviving cod may be part of local bay stocks (as in Trinity and Placentia Bays, in Gilbert Bay, Labrador, and possibly in the Bay of Islands), but knowledge about the location, life histories, and health of such stocks is limited. Even less is known about many newly commercialized and non-commercialized fisheries. Therefore, we cannot get a good handle on the effects of micro-scale interactions between fisheries and fish populations and the factors responsible for these interactions. Similarly, little is known about the impact of climate change, about changes in the timing and volume of freshwater inputs into these areas, or about micro-scale currents and tidal effects. Because depleted populations tend to have few year classes, and often tend to aggregate as abundance declines, they are particularly susceptible to the effects of environmental fluctuations and of pulse fisheries: we therefore also need to know much more about how environmental changes interact with remnant populations. Harvesters tend to ramp up effort and efficiency in fisheries that are being depleted and then to shift that heightened effort onto other, less abundant species about which we know very little. We still run a strong risk of accelerating degradation of fish stocks and overall marine ecosystems, even with cautious management and the removal of some harvesters and gear, especially when gears are non-selective.

Research vessel surveys, increasingly supplemented with data from sentinel fisheries and other sources, remain the primary basis for stock assessments, providing information on long-term trends in actual abundance of different species and information on year-class, length at age, and diet. The East Coast of North America Strategic Assessment Project (ECNASAP) database was constructed from research vessel survey data collected in the US and Canada (DFO trawl surveys) on living marine resources and their habitats. All Canadian mobile gear surveys follow a stratified random sampling scheme based on depth and, by controlling a range of variables (effort, location, depth, timing), these data provide a statistically valid

and reasonably "objective" means of measuring trends in abundance and distribution of certain species over time. Our assessment of the entire Atlantic Canada marine fish fauna (we analyzed 266 fish species) told us that more than 50 per cent (140 species) occurred in so few years that their status was "data deficient." About 18 per cent (49 species) had decline rates greater than 50 per cent and were therefore "endangered," and only slightly more (20 per cent, 54 species) were "not at risk."

We need to be aware of data problems and realize how they limit our analysis. One must, for example, know the generation time of a species in order to determine the appropriate time period over which abundance change should be calculated. It is also dangerous to extrapolate from a deep-water set of data to shallower waters, where ecosystem dynamics and the social-ecological history may be quite different. ECNASAP data have three basic shortcomings as a tool for historical reconstruction and for understanding interactions among fishing, fish abundance, and ecosystem change.

1. They are somewhat lacking in historical depth, and series do not have consistent start points across the whole region. The Department of Fisheries and Oceans (DFO) uses data sets that began in 1984. In another series beginning in 1970, only eight data points for Atlantic cod are available for North Atlantic Fisheries Organization division 2J (southern Labrador): this is two years after the "killer spike" in landings in 1968. Therefore, trends in abundance or distribution can only be measured from baselines (regardless of which data series) that already represent a heavily fished ecosystem.
2. Because of cost constraints, trawl surveys are not taken throughout the year, so the database contains sporadic data records for certain times of the year that reflect the original sampling strategy. In the northern Gulf, for example, the longest time series of data are derived from August surveys conducted only since 1990. This limits the ability to analyze intra-annual variability in fish distribution resulting from behavioural phenomena such as feeding migrations or spawning aggregations and related variations in the marine environment.
3. Research vessel (RV) data are the result of a sampling technology that limits both the location (depth) and types of fish sampled. Trawl technology cannot be used effectively in shallow areas, and so the database does not contain data records for shallow areas, which have historically been the areas of concentration for the substantial coastal fisheries in the province and include nursery areas for many species.

Until the 1950s, fisheries scientists often addressed gaps in scientific knowledge by drawing on fish harvesters' local ecological knowledge (LEK, or TEK, traditional ecological knowledge). Such admixtures of knowledge are a social-ecological product of interactions between scientists and fishers as knowledge-creators, who pool their historical and present observations, and the social environment that influences what they know, what they observe, and how they interpret that knowledge and those observations. In the early stages of scientific knowledge development in fisheries, catch information was the primary data source, some of it coming from local fishers, little to none from science. As fisheries developed, scientific data were collected and this new knowledge became more and more accepted as the basis for making decisions in the fishery while TEK/LEK was marginalized. In recent years, TEK/LEK has reappeared as a source of knowledge for science and management. However, there remain serious spatial and temporal mismatches of scale between TEK/LEK and scientific data – an issue that has not yet been seriously addressed. This must be resolved, because local ecological knowledge has a clear potential to fill in some of the serious knowledge deficiencies hampering our management of fisheries. If, for example, we can build a substantive knowledge through RV data, landings data, and LEK of abundance trends, life history, and population structures, it will help us see more clearly changes in fishing efficiency and their relationship to fish ecology, fisheries science, and fisheries management. This will help us address the kinds of gaps that brought about the collapse of the northern cod stocks, including the need to comprehend the dynamism of fisheries and the relationship of this dynamism with stock assessments and the impact of fisheries management initiatives. The quality of data available to scientists depends on our understanding this relationship. Since the collapse of the northern cod and northern Gulf cod stocks in the 1980s and 1990s, careful management of the fish that remain, and at smaller spatial scales, has become even more imperative. And it is at smaller scales, both in space and time, where TEK/LEK can be most effective. Such local ecological knowledge could remedy our lack of knowledge about the micro-spatial and temporal-scale dynamics of cod populations in inshore areas, and about the location and health of the habitat upon which cod and other marine species depend. It can also help to address significant information gaps about the social, cultural, and economic dimensions of the fishery at local and regional scales, something that is essential in managing social-ecological systems.

Our publications can provide detailed examples of the use of TEK/LEK in management science. Our detailed studies of changes in landings, effort, and stock abundance are producing fine-grained reconstructions of changes in coastal marine social-ecological systems with a particular focus on fish populations and fish harvesting over the past several decades. They have already provided important insights into the interactions between changes in fish populations, the fisheries, human fishing communities, and fisheries policy over time, which might, we think, eventually be incorporated into simulation models, thereby bridging the gap between macro modelling and micro data. "What-if scenarios" for management initiatives point to the depth of the management challenges facing this fishery and to the need for a comprehensive, multi-pronged approach. Thus, the micro and macro methodologies complement one another.

INDIVIDUAL TRANSFERABLE QUOTAS (ITQS)

Given the huge and well-known literature on ITQs, we focus instead on some of the behaviour that has become manifest as a result of using this management technique to limit fishing effort. In the 1980s, several years before the cod collapses, net lining, dumping, and discarding started in the northern Gulf (Palmer and Sinclair, 1997) along with the first individual quotas. Since then, the use of ITQs as a management instrument has persistently raised concerns about equity in access to stocks, since it encourages larger vessels and concentrates ownership in corporate hands. This concentration of licence ownership, combined with fleet reduction, means that small-scale community-based fishers cannot pay for the number of licences and the amount of technologically advanced gear needed for a viable fishing livelihood. Today, many licences are held by investors who then lease them to fishermen, reducing still further the share of fishing incomes captured by fishers and coastal communities (Cruikshank, 1991).

On the west coast, First Nations' quotas and allocations ensure some local benefit from local resources over time, but halibut, sablefish, and groundfish trawl fisheries now have many quota holders who don't fish themselves; rather, they lease their quotas to others at rates as high as 70-80 per cent of the revenue from the landed catch (Ecotrust Canada, 2004). On the east coast, individual quotas have many of the conservation and management advantages that economists and fisheries managers applaud, but are supposedly non-transferable, since the fleet separation policy of DFO means that IQs are supposed to be held only by fish harvesters and not by processors or others. Unfortunately, increasing evidence indicates

that transferability is occurring, thereby generating real concern that some people in the industry are making an end run around the rules, with hidden (trust) agreements tying harvesters to processors and leading to transfers of control of the resource away from small-boat fishers. These agreements, along with the growing practice of leasing quota, are undermining DFO's fundamental policy goals. Inequities due to removal of self-employment opportunities for current and future fishers and a serious erosion of the economic base of coastal communities are the result (Praxis, 2005).

ITQs are also maladaptive: we are losing TEK/LEK and apprenticeship and training resources. ITQs may be easier for DFO to manage, but they are not healthy for local communities, and – it now appears – not even for the stocks themselves, let alone the ecosystem, which is damaged by the kinds of technologies employed by large fleets, and these technologies destroy seabed morphologies and can produce large amounts of bycatch. Moreover, strong evidence suggests that quota-based management – particularly as the sole or primary approach to management – is not working as it should. Dubious or actually illegal practices certainly are one factor, but, more fundamentally, we do not know enough about either natural or fishing mortality to be sure of how many fish we are managing. Nor do we really understand the interdependencies between the different species that make up any given ecosystem, let alone the impacts of interactivity between fish and fishers on both the ecosystem and the human societies that depend on the resource that is being quota-allocated. This is doubly serious given that, once established, resource rights are hard to reverse. Sadly, fisheries science remains understaffed and underfunded, with the result that there are critical gaps in existing fisheries science. Moreover, some of the management measures currently being pursued, such as quotas, have created enormous problems for the small-boat fishery and its associated coastal communities.

CONSERVATION, OVERHARVESTING PRESSURES, AND SKEPTICISM IN LOCAL FISHING COMMUNITIES

Growing awareness in the 1990s of conservation concerns was reflected in a series of major policy documents, which we will not examine here except to applaud the fact that conservation has recently become a proactive policy goal. While we do not wish in any way to be thought to be arguing against conservation, we must emphasize that conservation policies need to be sensitive to the interactions between fish and fisheries if they are to be effective. In addition, they need to respect not only the needs of the fish, but also

those of fishing communities, many of which are dependent on the small-boat fishery. Conservation measures that offload the costs of management, monitoring, and surveillance onto harvesters, and at the same time ask them to reduce their harvests, can augment the pressure to overharvest.

On both coasts, not only policy-makers but also local people understand the crisis in the stocks. People have shifted where they can to alternative fisheries, but local attitudes remain problematic, particularly when fishers are told one thing and their local experience suggests otherwise. These kinds of issues can be resolved through discussion and co-management structures that bring local people into the debate (see Chapter 7 for more on this).

Multiple conservation strategies are needed that attend to ecosystem health as it relates to community well-being. In other words, co-management structures should focus not only on processing and harvesting, but also on Marine Protected Areas, species-at-risk strategies, recreational fisheries that benefit local employment, and eco-tourist endeavours, and these co-management structures should also account for the survival of a small-boat fishery when that is essential to community survival. Said otherwise, we need to think in terms of both a precautionary approach to the fishery and the development of an adjacency principle in fisheries management that will respect the prior claim of local communities to affordable and equitable fishery-based development. We also desperately need a solution that does not trade off ecology against society – or vice versa. This is a false dichotomy because people have a right to their livelihoods, but those livelihoods depend on the presence of healthy resources and ecosystems. In addition, local people are potentially the best and most effective stewards of those resources. We must not let control of our marine environment be taken over by a geographically footloose high-technology industry, whose vessels can simply move on when stocks are depleted. That will not build either social or ecological security in Canada. It is important to think in terms of the future of both fish stocks and local communities, but employment in these places, as of now, remains a major concern. We turn, therefore, to livelihoods, which are the social part of social-ecological analysis.

LIVELIHOODS

On both coasts, people have traditionally depended on fisheries and/or forestry-related work. Both industries have undergone dramatic restructuring, including substantial downsizing, in the past 15 years. For the east coast, the period between 1985 and 2003 has

been one of substantial downsizing and reorganization within both industries. Fisheries and plants closed and Newfoundland and Labrador groundfish landings shrank substantially between the late 1980s and late 1990s; recovery has been associated with major changes in the shape of the industry in terms of species harvested and processed, products generated, and professionalization. In the absence of cod, fishers in both the inshore (defined as boats under 35 feet) and midshore (35-65 feet boats) sectors are now highly dependent on the harvesting of snow crab, lobster, and, in some cases, shrimp, with shellfish (particularly crab and shrimp fisheries) expanding since the early 1990s to become the dominant species harvested at present.

In 2002, the production value of the provincial fishery reached an all-time high at over $1 billion, with landed value of all fish at $515 million, although $421 million of this (82 per cent) came from shellfish. Shrimp has been less profitable than crab because of problems with low prices and competitive markets and it is very difficult to sustain a fishing enterprise on either lobster or shrimp alone. In particular, harvesters with full-time and supplementary crab licences had higher incomes in the 1990s. In recent years (2004-2006) dwindling crab prices and escalating prices for gas, insurance, and other costs have triggered a cost-price squeeze in this sector. Since the mid-1990s, then, the wealth generated from the fisheries has been much less equitably distributed than it was in the past, despite the introduction of licences and small quotas of crab and shrimp for owners of smaller boats. While specific numbers vary from one region to another, it is not uncommon for harvesters in the midshore fleet to receive quotas that are five to ten times those of inshore harvesters living in the same communities. Crew members' shares of the catch have also tended to decline in recent years relative to those of skippers and boat owners (not always the same individuals).

Those in the processing sector and other fishery-related occupations benefited less from the good crab prices and increased crab and shrimp quotas than harvesters. Most of these individuals have had a hard time making ends meet in the post-cod era, due to low wages and short seasons, and many now face tremendous uncertainty about whether they will be able to remain in their communities in the future. Moreover, changes to the Employment Insurance (EI) program in 1996 have benefited harvesters while penalizing processing workers.

Communities have each been affected a little differently by this sectoral restructuring. The plants that remain in the study area all

have an aging workforce and, at the time of our interviews, many people raised concerns that the same problems were developing with the newer species as had occurred with the cod – shrimp sizes were down, for example, and the market was glutted. The future of the plants, and hence employment, is therefore still a concern; workers also worry about seniority and hours, needing enough time in each season for an EI claim. They also worry about their health, as different occupational hazards come with the new species, such as the respiratory illnesses associated with processing shellfish (Howse et al., forthcoming). On the harvesting side, all areas have seen a reduction in the number of smaller, inshore boats and often increased seasonality within fishing. Rather than training sons or hiring helpers, many inshore fishers are fishing with their wives to keep money in the family. The recent professionalization of fishers has meant increased training costs, and harvesters are also grappling with increased costs and responsibilities for integrated management plans, licensing, observer fees, and dockside monitoring fees. The shift from groundfish to crab and shrimp, along with an increase in the seal hunt in the late 1990s, was associated with an increase in search-and-rescue incidents and compensation claims in the fishery, as vessels designed for fishing one species and for working close to shore began to travel much further offshore.

The interrelated effects of environmental, industrial, political, and social restructuring have altered the context in which individuals, families, and communities try to sustain livelihoods and health. Today, the combination of technological change, globalization, and the cumulative effects of decades of exploitation of the resources are severing the link between corporate success and local employment opportunities. This is reflected in both reductions in the number of jobs in the traditional sectors (fishing, fish processing, and logging) and changes in the nature of the jobs that remain in these sectors (loggers now work on their own, rather than as direct company employees; the structure of fishing crews, vessels, gear, and fishing practices have changed; shellfish processing is more automated and less labour-intensive than groundfish processing; and more processing takes place outside the country). Seasonality has also altered: the fish-processing season has shortened and two-thirds of our respondents reported a decrease in hours worked in the last five years.

There is also a gender dimension to precariousness. Women's employment shows more volatility, with more job changes over time, perhaps because their jobs are more vulnerable (fish processing, tourism, retail sector versus fishing, forestry, construction, trades),

or because they may shift jobs more readily in response to family needs or partner's work. In some cases women are moving from "unpaid" work supporting a family fishing or forestry operation to paid work within family enterprises; in others, women have gone to work to ensure some stability in household incomes when there is insecurity and volatility in husbands' incomes. However, some opportunities have opened up for women and men in tourism, albeit often at significantly lower wages and with less job security than in fish processing.

The fact that more women are fishing with their husbands is best understood as a household response to deteriorating employment options in fishing communities and diminishing incomes from fishing coupled with escalating costs. The strategy is dangerous. It means that husbands and wives frequently have to share some serious vulnerabilities: women are often poorly prepared for the dangers of the job, the couple is literally in the same boat, and thus both are vulnerable to bad weather and other hazards as well as to economic downturns in the small-boat sector.

While conservation measures at the federal level seek to protect overfished stocks, both the industry and local communities have shifted to new fisheries in an attempt to provide industrial flexibility and community resilience. At the same time as employment falls in the wild fisheries, there is increased employment in aquaculture (see below), particularly in British Columbia, although growing evidence now indicates that the increase may be short-lived.

Common themes abound: the coasts have very similar stories. In the 1990s, declining stocks of Pacific salmon, fishing fleet overcapacity, and a 30-50 per cent decline in prices for all salmon species necessitated substantial restructuring of the west coast fishery. The Department of Fisheries and Oceans introduced the Pacific Salmon Revitalization Strategy, referred to as the "Mifflin Plan," in 1996, which aimed to reduce the west coast fishing fleet by 50 per cent over several years, thus conserving threatened salmon stocks and improving the viability of the fishing industry for remaining fishers. This resulted in the buyback of 798 licences and a loss of fisher-related income for 2,750 individuals in the first year of the program. There were also associated job losses in the fishery supply sector (Pacific Salmon Revitalization Plan Review Panel, 1996). By 1999, the number of commercial salmon licences in B.C. had dropped to 2,557, down from 4,112 in 1996.

Many west coast communities traditionally had substantial locally based commercial fishing fleets and some had processing facilities for the commercial fishery, many of which are no longer op-

erating: current restructuring has to be understood as occurring with already severely depleted resources and on the heels of a spiral of downsizing that has been in process since World War II, accelerating in the last decade. As salmon catches declined, some fishers on this coast also turned to other species, such as hake, which have also proven vulnerable to natural fluctuations and overfishing. Further, for many in rural west coast communities, the costs of getting into "new" fisheries or purchasing additional salmon licences (needed for fishing the whole coast as many once did) are prohibitive. For those who remain employed in the commercial fishing industry, the inherent *unpredictability* – erratic harvests, variable fish prices, competition from foreign offshore processing ships, and closure of fish plants – is a source of stress and insecurity.

The downsizing of the commercial fishing industry, implemented to stabilize fish resources available to communities by limiting extraction, has had economic repercussions for individuals and the communities themselves. Among some interviewees, concern that the Mifflin Plan disproportionately impacted small, independent fishers and smaller communities has fuelled grievance against "the south," i.e., the provincial government in Victoria and the corporate interests based in Vancouver. This industry downsizing emphasizes the problems of a lack of economic diversity and dependence on a limited number of industries, which have combined to make communities more vulnerable during economic restructuring. The changes have hit First Nations communities particularly hard. The fishing boats in these communities were often smaller family boats, used commercially only in the short salmon season and providing transportation and access to local food resources during the rest of the year. It was precisely these smaller "less efficient" vessels that the Mifflin Plan targeted in favour of a high-technology, multi-purpose corporate fleet.

POLICY IMPLICATIONS

The restructuring of state policies has been an important component of global restructuring since the 1980s. Reforms within many sectors, including fisheries management, have emphasized privatization, individual responsibility, the targeting of social programs to selected groups, the provision of state support (often through tax cuts) to the corporate world, and in particular economic "efficiency." This has meant a shift in what governments do. In fisheries management, the policy direction has been to limit access to the resource, creating more regulation in the name of market principles and resource sustainability. At the same time, some responsibilities

(monitoring and infrastructure, for example) are being downloaded to fish harvester groups and to lower levels of government, such as port authorities. Issues of environmental sustainability, equity, and economic efficiency continue to play off against one another. Moreover, while on the one hand fish are scarce and (despite global shortages) prices are often low, on the other hand, people have to eat and their communities have to survive. Obviously, then, fishers' insecurity will be heightened when management is quota-based in such a way as to be biased more towards corporate interests than to small local enterprises, at the same time as additional management and harvesting costs erode the livelihoods of coastal people.

Resource degradation and heightened fishing capacity, coupled with an emphasis on efficiency, together mean that we now have far less latitude for error in fisheries management today than we had 30 years ago. Management for recovery will require more comprehensive and finer spatial, temporal, and organizational scale approaches to studying and to managing our fisheries. To do this while also promoting equity and the health of coastal communities will be very challenging. Current fisheries management is bedevilled by mismatches between its scale and system of management and the scale at which the ecosystem functions (see our earlier comments on the need for better science), with the result that fish stocks remain scarce while management regimes encourage misreporting and illegal activities.

Scale mismatches and risk and benefit misalignments need to be identified and dealt with creatively, in ways that take the interactive nature of change in social-ecological marine systems into account. We need to find fiscally feasible ways of creating recovery strategies where the social support for those investing in conservation will be intergenerational in focus, thus reflecting the long-term combined goals of stock and human community recovery. We need multiple conservation strategies that are inclusive of habitat and rich in knowledge about life history, predator-prey interactions, and larger ecosystem processes, and these strategies must also reflect a deep understanding of the human dimensions of fisheries. Science and management need to be more socially inclusive of elders and retired community members as well as of the current and future generations of harvesters, processing workers, and other members of their communities. For this to happen, leadership, innovation, and experimentation need to be encouraged within communities, within government bureaucracies (federal, provincial, and municipal), within science, and within schools and other venues.

More broadly based research in coastal areas, to match that from the deep-sea sector, is also needed. Our shore-based fisheries infrastructure has been passed over to communities, often without the financial and capacity-building support required to protect that infrastructure. In addition, far too little has been invested in assembling, testing, and deepening existing knowledge of fisheries ecology and the state of our marine ecosystems. Likewise, support for local efforts to experiment with different approaches to management and enhancement, and for the transfer of the lessons learned from those experiments, has been inadequate. Where innovative conservation initiatives have happened, such as in Eastport, N.L. (Ommer and Team, forthcoming), these have often been achieved despite government resistance; they also are treated by government as pilot projects that are somehow expected to reproduce themselves spontaneously and without financial and scientific support in other areas. Despite the relatively recent requirement for harvesters to generate conservation management plans, and with the shift to integrated management, much management (and hence capture practices) is still based largely on top-down single-species management – and the science is still running behind actual fisheries practice.

It is clear that greater efforts to incorporate the insights of resource users into decision-making processes will not be sufficient to manage fishery resources effectively. Significant reinvestment in state and academic research will be necessary if we are to improve our very limited understanding of marine ecosystems and increase our likelihood of being able to rehabilitate fish stocks. Improving DFO/fisher/fishery community relationships is going to take a great deal of time, energy, and resources – all of which now appear to be in short supply.

Decisions should be science-driven in the management of natural resources such as fisheries, and the science should not always have to be catching up with what is going on in fisheries practice. The ecological and biological facts about fish – distribution, population structure, etc. – are very important, and are the core of Canadian fisheries. More effective use of local knowledge from fishers needs to be built into the science. Fishers often have knowledge about the spawning and nursery locations and migration patterns of the fish stocks that could be harnessed more effectively to develop a recovery strategy for our fish and shellfish resources based on a co-management structure. Indeed, science and management need to be much more inclusive, working with the knowledge of those who are retired harvesters and with elders: we need to manage for the future,

which is something in which community elders and experienced harvesters have considerable skill. Prognostics are much aided by such input, bringing it within the domain of management science.

Above all, co-management must not mean the abdication of government responsibility for protecting and enhancing marine resources, providing social support, and promoting health in coastal areas. Neither should the price for stock recuperation be community disintegration, deepening social inequities, and related deterioration in the health of fishery people. To date, governments have been unwilling to put the required funding in place to support ongoing recovery of fish *and* fishing communities on both coasts. DFO needs to come to grips with the inadequate state of ocean science; it is also vital that Fisheries officials make a commitment to the long-term survival of a wild fishery, and that they work with other government agencies in pursuit of equity as well as efficiency if our coastal communities are to survive.

Forest Products 2

Canadian coastal communities are experiencing part of the continental-scale downgrading of North American forest resources: landscape-scale reduction in complexity and age of forests logged during the past two decades has been measured through aerial photos, ground surveys, and, more recently, from satellites over Haida Gwaii (Queen Charlotte Islands) and other Pacific coastal forests in western North America (Gowgaia Institute, 2003). On the east coast, a cyclical and competitive industry has continued to become increasingly capital-intensive as surviving companies struggle to increase productivity and thus re-establish threatened profit margins. Local labour feels the pinch and this translates into human stress in forest-dependent places – mill towns like Stephenville and logging towns like Hawke's Bay. Maintaining production, let alone expanding it, has put pressure on environmental resources and led to conflict over how forest resources should be used. We found evidence of local conflict, distrust of external powers, complaints about lax enforcement of regulations, and frustration over limitation of traditional rights of access to wood in places such as Main River.

Through time, there has been an increase in labour productivity in the forestry sector, a favourable trend for some, but not all, workers. That increase has resulted in the number of forest workers declining faster than the decline in volume of wood cut and processed. This throws into question the whole issue of the historical sustainability of the forest industry in Newfoundland. While the quality and benefits associated with employment in the forestry sector have improved for individual workers, each job places an increasing demand on the forest. In 1954, 154 cubic metres of wood represented one job in Newfoundland's pulp and paper industry. By 1989, technological and labour changes in the forests set a job at 651 cubic metres. This is restructuring with a vengeance.

Associated with these changes over the same period has been a consistent change in the effect of people on the landscape. Cutting

prior to 1950 was concentrated along river valleys and lake edges, which provided productive forest sites and easy waterway transport of wood. Over time, cutting has become increasingly dispersed, a pattern facilitated by road construction and heavily subsidized by tax dollars, but also determined by insect disturbances and an oldest-first, regulated-forest cutting policy. The result of this forest management history has been a movement towards an even-age distribution of forests on the landscape, which has complemented the increasingly mechanized industry as paper markets expanded especially outside Canada. The landscape impacts of the forest industry in Newfoundland have rarely mimicked natural disturbances, and ecosystem health under such practices must be seriously questioned.

Policy contexts undoubtedly influence what actually happens in the forests and mills (through regulations, taxation, and financial support) but do not fully determine it. While environmental concerns have resulted in more forest management policies, many operators now find themselves squeezed between conflicting, or contradictory, demands of the companies and the regulatory agents. For example, regulations require that all logs over 15 inches be taken for sawlogs or a fine will be incurred; however, the sawmills will reject 15-inch logs as too small. Loggers will also be fined for butt-junking (cutting away too much rot), but logs with rot will be rejected by the mills. Again, the intensification of harvesting is yet another instance of the reduction of flexibility at the lowest levels of an industry in order to provide flexibility further up the industrial system.

In short, the future offered to rural people by the forest resource remains unclear. Present-day corporate strategies are creating pathways for social-ecological damage, and government policies are leaving local contractors, not the large wood processors, bearing the cost of the environmental regulations, a situation strongly reminiscent of what is happening also in the fishery. When one considers the decreased flexibility now experienced in outport communities as a result of decline in fishing and forestry – the two main foundations of their community survival strategy of occupational pluralism – the resilience of these east coast communities can be seen to be in serious jeopardy.

On the west coast we found an equally problematic social-ecological history that unfolded in essentially the same way. In British Columbia the coastal forests were historically a major source of wealth, with sawmills, concentrated on the southern coast, dominating the industry. The northern coastal areas were of only

marginal interest, with a few sawmills supplying the numerous salmon canneries dotted along the inlets. Government tenure policies were introduced with the intention of stimulating the industry, but the result was a surge of speculation, with timber interests being acquired as investments rather than for harvesting. The early 1980s crisis in the world economy was felt on the coast, at the same time as reports of exhausted forest resources multiplied and it became obvious that companies would have to commence logging in less accessible areas if they were to survive. The unsurprising result was capital flight as "depleted holdings, ageing mills, pollution abatement costs, pressure on the land base from environmentalists and First Nations, the softwood lumber dispute, and the appeal of fast-growing forests in the southern hemisphere all contributed to de-investment" (Rajala, ch. 8). Government faith in the private sector has proved, at best, naive. Corporate flexible production has become the industrial order of the day (as it has on the east coast) and employment has slumped even further as rigidities are shifted downward in the system to the level of communities, households, and workers.

Fisheries and forests have also come into conflict as single-sector policies on both coasts have failed to consider the linkage between sectors for local communities. However, the employment consequences are severe for households and communities as a consequence of difficulties in both sectors occurring simultaneously. Local communities have offered potential solutions, but they have been ignored. Now, however, the principles of a December 1997 Supreme Court ruling (*Delgamuukw*) have legitimated Aboriginal oral evidence, and Aboriginal title, not only to land but also to the resources thereon. On the west coast at least, patterns of negotiation will now have to look different and some community voices will have to be heard, but corporate failure and bankruptcy, along with labour disputes, have taken their toll. As yet, there is no change of political heart, and the sensible solutions proposed by local communities are yet to be taken seriously.

There has also been an ecological impact of west coast forest industry practices on the marine environment. The temporary storage of harvested logs in estuarine areas has been a common practice in many parts of eastern and western Canada for nearly two centuries. While the practice has been severely curtailed in eastern Canada in recent years, this way of dealing with the handling, storage, and marine transportation of logs is still extremely important in British Columbia because of the remoteness and rugged character of most of the coast and the absence of land-based transportation routes.

Estuaries are preferred sites for temporary storage, both because they are usually adjacent to areas accessible by local logging roads and because they have low salinity. The latter is very useful because low salinity inhibits the development of shipworms (teredos, *Bankia setacea*), which are highly destructive of wood.

We developed techniques for the identification of wood debris accumulations, which allowed us to document its extent in areas near log-handling sites. We then characterized the physical and chemical characteristics of sediments in areas where log booming has occurred and compared these to places that had not been used in this way. This allowed us to determine the impacts of the accumulations of wood debris on epifaunal taxa in estuarine areas (for details, see Ommer and Team, forthcoming: ch. 6). Where log booming has occurred, we found very high concentrations of whole logs, in some instances in stacks up to 10 metres high above the sea floor, along with bark concentrations of more than 80 per cent in some locations and an average over the whole study area of about 40 per cent. Our examination of towed seabed videos suggests that large benthic predators avoid wood-dominated habitats: we observed Dungeness crabs (*Cancer magister*), for example, five times more often in the unimpacted areas, while sunflower seastars (*Pycnopodia helianthoides*) were 25 times more abundant in areas without wood debris.

What this means is that we can now say that *the impact of industrial log-storing practices is neither temporary nor trivial.* On the contrary, these practices change both local habitat and the ecosystem to one in which less commercial species replace those that are important for commerce and human diet.

LIVELIHOODS

Now that the traditional industries offer less work as a result of technological changes, resource depletion, and industry concentration, communities and governments have had to adopt a new economic model in which full-time permanent employment is no longer expected. The forestry industry on the Great Northern Peninsula of Newfoundland has seen dramatic changes since the early 1980s, with pulp companies dominating the industry. Instead of hiring their own loggers the practice has been to work with contractors. Furthermore, mechanical harvesters have come to dominate the logging industry over this period, each doing the work of about 12-14 men. As a result there have been considerable changes in the conditions of work and the number of contractors and loggers over the past 15 years (in White Bay South one estimate is that the number of loggers has decreased from around 400 to barely 100).

While some older conventional loggers are able to continue work, younger ones are not being taken on.

This period also coincides with the introduction of new forest management policies and regulations, which have further shaped the industry. As part of an effort to improve the yield from the forest, a modern lumber sector has been encouraged, both by regulatory policies and by government support programs. New integrated sawmills, such as one in White Bay South, provide employment; however, smaller sawmills, like small logging contractors, have trouble in the new milieu.

Restructuring in the B.C. forestry sector, which was always more developed than that of the east coast, is still very similar to it. Large-scale changes in the market economy (e.g., international duties, unstable foreign markets), excess capacity, and degradation of the natural resource base have had serious repercussions for coastal communities dependent, in part, on forestry for employment and community infrastructure. Primary forestry was traditionally an important employer in Port Hardy, Ucluelet, and Tofino, and wood processing has played an integral economic role in Prince Rupert while being an important contributor to the economies of Port Hardy and Ucluelet. All four communities have seen employment opportunities in forestry sectors diminish in the past 10 years, though Port Hardy has been hit less hard than the other three communities.

In Prince Rupert, the closure of the Skeena Cellulose pulp mill in June 2001 had serious repercussions for the community, as it had been the largest private-sector employer in the city. Its closure resulted in the direct job loss of 750 employees and indirect job loss for 1,331 people (Prince Rupert Economic Development Commission, 2002). In a community already experiencing downsizing within the commercial fishery and fish-processing industry, reductions in port activities, and the subsequent closure of another local timber-processing facility in October 2001, the closure of Skeena Cellulose illustrates the economic vulnerability of resource-dependent communities. Elsewhere on the coast, the story is not dissimilar.

The conservation of coastal temperate rain forest in Clayoquot Sound has influenced community health in Tofino and Ucluelet significantly. Within the context of several international conventions to which Canada was a signatory, the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound made recommendations for integrating the knowledge and values of local indigenous and non-Native peoples and for incorporating the most current scientific understanding of forest ecosystem functioning (Clayoquot Sound

Scientific Panel, 1995). In 1995, the provincial government adopted the scientific panel's 120-plus recommendations in their entirety, which rendered obsolete former forestry regulations in the area and ended conventional logging practices in Clayoquot Sound (Ecotrust Canada, 1997). The land-use decisions in this region have had profound, though different, effects in Tofino and Ucluelet, contributing to an expanding tourism industry in Tofino while causing substantial job loss and business closure in Ucluelet.

The perception among many coastal residents is that restructuring within the forestry sector, precipitated by both economic and political decisions, has not only resulted in layoffs from large forestry companies, but has also had negative consequences for small, independently owned operations. In both Port Hardy and Ucluelet, interviewees involved in the forestry industry commented that it is very difficult for small operators to maintain a viable business in the present economic climate. Small forestry businesses that have provided employment and contributed to the local tax base have closed or relocated. There is little incentive for individuals to invest time and money in forestry-based businesses.

Given that industrial restructuring, backed by government policy, has resulted in less employment and also less flexibility for local coastal people, it would appear that government social programs might be expected to help people as they adjust to such restructuring. But such is not the case.

POLICY IMPLICATIONS

Importantly, the species composition, structure, and function of Canadian forests have all been irrevocably altered. The introduction of exotic trees and pathogens has diminished the extent of native trees (e.g., American chestnut, American elm, and eastern and western white pine), fungal and arthropod populations have declined due to air pollution, and changes to decomposition and nitrogen cycling rates have been created by urban heat islands. Overall impacts on biodiversity and resilience of forests due to the conversion of natural forests to tree plantations are largely unknown, but initial evidence suggests that regulated, even-aged forests support a simpler food chain and result in altered nutrient cycling when compared with probable pre-European conditions.

As in fisheries, little attention has been paid in industrial forestry to forest species other than economically important "fibre" species. And, as in fisheries ecosystems, the alteration of natural forest ecosystems proceeds apace without due consideration of possible (even probable) consequences. The replacement of old-growth

forests (with their diverse age structures and multiple successional stages, which result from natural and indigenous disturbance regimes such as fire) has already had unforeseen consequences in terms of infestation, loss of biodiversity, fire, mudslides, and other such hazards. We have also lost opportunities for regional diversification through the large-scale export of raw logs and other primary forest products. Nor do we know the effect of wholesale exploitation of commercial species on the totality of forest ecosystem services.

Research elsewhere is now showing that, in natural situations, gap disturbance determines forest structure and processes more than was previously assumed. We also now know that a higher incidence of fragmentation on the landscape scale is created by logging, compared to wildfire depredations, and that forestry activities have operated within a much narrower range of variability in emulating fire cycles than the large range of natural variability. Moreover, an overall reduction in diversity due to industrial forestry practices has been noted for tropical forests, while the risks to temperate and boreal forest populations and habitats are potentially high in terms of lost ecosystem services alone. Worse still, changes in climate or other environmental thresholds can produce unexpected results in mismanaged forests – "catastrophic regime shifts" can be anticipated, in which a system can have alternative attractors on a landscape scale, even if this does not occur on a local scale. Obviously, such shifts in forest ecosystems will impact aquatic and marine ecosystems as well, for example, in the effects of logging on salmonid habitat or the impacts of ocean log dumping and storage on benthic communities and productivity. There is a real need to improve foreshore lease relinquishment regulations for forest practices. We also need surveys – before, during, and after industrial use – that assess the status of the foreshore and subtidal lease adequately. These need to become standard governmental practice. A generic restoration program for heavily impacted sites should also be established.

The forest products industry has become more global in the last few decades, and in the global market there is pressure to compete through cheaper sources of raw materials (fast-growing pine plantations in the southern US, for example). In the context of both coasts, this has translated into local strategies to harvest a dwindling supply of wood more cheaply. While this pressure is not new, the pace of change has escalated in recent decades. The tools used by the companies in their quest for raw material and to protect profits include political pressure to preserve and enhance priority access to forests, technological innovation, and restructuring of labour relations.

However, the outcomes are becoming highly contested, given the competing interests of other forest industry actors (sawmill operators, loggers, contractors), other forest users (ecotourism operators, guides), and environmental groups. In recent years, the competition has intensified as the resource has become depleted and as the employment the pulp and paper companies can offer to people living in forest hinterlands has dwindled.

Nonetheless, as the locus of natural-resource exploitation and consumption has shifted from the local to the global, the residents of our coastal study areas have experienced tremendous pressure on local forest resources in a globalizing economy much as they have in the fishing industry. The legal recognition that First Nations' rights have been alienated may help to redress some of the inequities of history on the west coast. It is to be hoped that on the east coast, where settlers also had claims that predate those of corporations (albeit without the time depth that applies to First Nations), coastal communities may find governments prepared to take more note of community rights. But to this point, in the forestry sector as in the fishery, local communities' needs and rights, and the health of the environment, have received seriously inadequate attention. The passing down of rigidities to the local level and the subsequent ignoring of recommendations at the community level that might restore flexibility and community resilience do not bode well for the future.

The underlying pattern in the industry has been that of the creation of environmental degradation, coupled with market and technological vulnerability, which is global in scale. To date, this inexorable pattern has resulted in significant social-ecological distress. The forest products industry on both coasts has created significant damage, which over the long term has had an impact on both the environment and society in which it operated. Sadly, government policies on both coasts until very recently (and again now in B.C.) have demonstrated an inability to think beyond a mono-staple mindset and a very rigid and narrow idea of what constitutes development. Local people in this sector have been seen, time and time again, as "the problem," with industry viewed as "the solution." Resource depletion has passed unnoticed – unless it has been perpetrated by local communities, and then the reasons why this might happen have been totally ignored. Governments continue to be caught in a mental staple trap, rarely thinking even out of the forest box into diversification or local control, and never into local development and flexibility. The flexibilities that have been approved in this sector on both coasts have been corporate, although the evidence for both coasts is

that this has not, and does not, and cannot benefit regional economies and coastal communities. This is fundamentally important in the light of a global context of decreasing forest ecological health.

Non-Renewable Resources: Mining; Oil and Gas 3

There has been a history in the non-renewable resource sector of governments being seduced by large capital investment and major short-term employment potential into promoting resource industries as a panacea for economic ills. This is at least in part because such industries pose a significant "entry problem" for small-scale enterprises or local communities since the extraction of such natural resources requires heavy capital investments in technology and infrastructure. Moreover, the nature of the extraction processes are such that their potential to affect human and environmental health adversely is considerable, and considerable consequences then arise for people, communities, and ecosystems.

The story of mineral resources on both coasts is one of ecological damage, some environmental protection, economic development, underdevelopment, and non-development. Though many things were different on the two coasts, and many things changed over time, other factors remained fairly constant on both coasts:

- a close relationship between business and political interests;
- a depiction of the regions' mineral potential as a key ingredient in the industrial possibilities of the region;
- a willingness on the part of government to grant incentives and concessions to possible developers in order to stimulate industrial development;
- a tendency to downplay or ignore considerations of safety and environmental impacts in exchange for jobs;
- a marked lack of security and control that can be the result of outside ownership of an unpredictable industry;
- the maintenance of economic and technical ties with mining interests from Britain, Canada, and the U.S.

At the same time, these industries have provided much-needed employment, helped to open up land-based resources, and spurred

infrastructural initiatives, so they were in some ways useful as well as politically and economically attractive. However, they brought with them ecological impacts on the affected areas, including (for mining) air pollution and damage of local vegetation, with many of the environmental impacts still evident in the soil. The detailed stories of the communities considered here reveal much about the perils of the mineral non-renewable resource sector, the kind of "development" it entails, and its implications for economic sustainability and human and environmental health. The notion of pursuing development through large-scale, resource-extractive industries, and of attracting investment and creating employment through concessions, is still very much with us in debates surrounding, for example, the discovery and extraction of the large nickel deposits at Voisey's Bay in Labrador.

It is, therefore, encouraging to see that some lessons have been learned with respect to the modern east coast oil and gas industry. The process that carries an environmental impact statement (EIS) to an environmental protection plan (EPP) and then to an environmental effects monitoring (EEM) program has evolved on the east coast over nearly 20 years. The result has been an EEM program that has real community input and a strong science basis that rests on the principle that effects are predicted and then tested by EEM, and the rigour of this design exceeds that generally used elsewhere in the world. The overall lesson has been that a good environmental program results when community input is embodied in the EPP process and when predictions of effects are tested.

To compare the history of offshore oil and gas development on the east and west coasts of Canada is to see that some lessons about the prosecution of non-renewable resources have been learned, while others have not. Once again the political context is important, framing both the manner of resource exploitation (regulations) and its revenue outcomes (jurisdiction). We found that regulation of oil and gas in Newfoundland, in the short term, has been effective from a social-ecological point of view. The process has been successful in engaging the community in the assessment and monitoring process for the environment. Newfoundland and Labrador currently has one of the fastest growing provincial economies in Canada as a result of post-construction activity generated by oil development.

In the Queen Charlotte and Tofino Basins on the west coast, our work produced new interpretations of old issues, as well as new results made possible by new technologies. In the QCB, when archival seismic data were reviewed and basin structures and faults interpreted, deficiencies were found in the existing data sets. Sea-floor

geohazards have been identified and linked to subsurface structures. Also, sea-floor habitats have been identified and assessed for biological productivity and possible Marine Protected Areas. The new technology and the surveys we carried out can be applied in any of the B.C. coastal basins.

In terms of oil and gas potential on the west coast, we confirm that the QCB has the best prospects for oil and gas development, being both the largest of the four basins and with what appear to be the most reserves. The Tofino Basin appears to be promising with respect to gas, but the prospects for oil are less clear. The Winona Basin, lying to the northwest of the Tofino Basin, is the least likely prospect and would probably be the most difficult to develop. That said, it is not yet clear how much oil and gas is out there, but it appears to be less than was originally thought.

POLICY IMPLICATIONS

We conclude overall that non-renewable resources have always been viewed as important opportunities to diversify the economy beyond traditional sectors, despite the fact that, like all staple industries, they have always been influenced by economic developments external to the provinces. This is even more pronounced today as national and provincial economic restructuring makes them more highly integrated in the national, continental, and global arenas.

With oil and gas, Newfoundland and Labrador sought to avoid the boom-and-bust cycle that had characterized earlier non-renewable resource development. Thus, the long fight for ownership ensued, as governmental cross-scale inequities were feared, on top of the other losses of control that the role of transnational corporations and the need for foreign investment bring with them.

The rhetoric of development on the east coast (though marked by some key differences from the earlier period) is still with us. However, awareness of environmental and (on the west coast) First Nations issues are new, while the interplay on both coasts of national and provincial politics remains a crucial aspect of resource development. Modern oil and gas development has the added dimension of modern fiscal arrangements to consider, making the deal concluded between the federal government and the Newfoundland and Labrador government in January 2005 important because it positions the province to capture the full benefit of the resource within its period of exploitation.

The socio-economic outcomes of potential offshore oil and gas development and production on the west coast are very much on the

public agenda as issues are brought to the forefront and new studies and research are initiated. Primarily, concerns have been raised about the potential environmental effects, but economic and social implications have also come into play: the overall issue is one of social-ecological health. Before development can proceed, appropriate fiscal and regulatory regimes will be necessary to address environmental and other concerns. Agreements will need to be negotiated over revenue-sharing from oil and gas at the federal, provincial, and municipal levels; assurance will have to be given to First Nations peoples about revenue, land, and marine usage; ownership rights and best-practice environmental protection will have to be resolved fairly; and assurances will also need to be given to other coastal communities about best social-ecological health practices. Following all this, industry will need to judge whether or not the investment is worthwhile.

For the province of British Columbia, the economic benefits of offshore oil and gas production could be significant, although how such benefits might be distributed, and whether or not coastal communities would partake significantly in such benefits, remains to be seen. Benefits are likely to occur in the form of direct and indirect increases in incomes and employment at the exploration, development, and production stages of energy activity, with the greatest annual impact likely to be at the development stage. In addition, the province will benefit from enhanced infrastructure, an increase in trained labour, expansion of knowledge, and new knowledge acquisition in a range of service sectors. Handled well, this will underpin future economic development. The provincial treasury will also benefit from royalty and other revenues derived from oil and gas activity (assuming that the new accord, should it occur, would resolve current problems over clawback of revenues), as well as from taxes levied on labour income, company profit, and expenditures on commodities generated through initial and subsequent round spending in the multiplier process.

At the regional level, larger coastal communities (e.g., Prince Rupert, Port Alberni) may have economic benefits if they support supply centres or other service industries, although some communities may be too small to supply what industry needs. If coastal people are to benefit, it is likely to be mostly through jobs on the rigs or at the supply bases rather than at home, and through possible revenue-sharing with the provincial and federal governments, local spending from any "legacy" or savings fund that might be set up, or local benefit agreements. At the sectoral level, it will be necessary to guard against negative impacts on the fisheries, tourism, and aq-

uaculture. Increased opportunities associated with the industry will attract transient workers and, if communities are not careful, attendant social problems. In short, any development of coastal oil and gas reserves needs to be cognizant of the importance of guarding against damage to social-ecological health – environmental risks and negative socio-cultural impacts, including effects on Aboriginal livelihoods, heritage, and ways of life, as family stresses associated with shift work and differential job opportunities will undoubtedly arise. The "good news" is that examples exist of ways to guard against these ills.

The Impact of Restructuring on People's Health and Lives 4

With few exceptions, the communities in our study areas have experienced *declines in population* that are related to migration but also to changing birth rates. Particularly in rural Newfoundland and Labrador, migration has been a long-term adaptation by local people to perceived opportunity elsewhere and moving away is something that many individuals on both coasts consider, even in relatively good times. However, *it has profound effects on the local society when most of the youth, whole households, and even a majority of local residents take this decision.* The most marked recent west coast decline occurred in Prince Rupert, where the population decreased by 11.8 per cent from 1991 to 2001, all of which came after 1996. Port Hardy, on northern Vancouver Island, has seen similar changes; the population declined by roughly 13.4 per cent between 1996 and 2001 following an increase in the previous five years. The sole exception is Tofino; owing to its flourishing tourism-based economy, the population increased by 33 per cent from 1991 to 2001. In comparison, the population of B.C. grew by 16 per cent between 1991 and 2001 (all numbers based on Statistics Canada, 2001).

The most dramatic change occurred in the years 1996-2001 when all five areas on both coasts lost substantial population, with only Alberni-Clayoquot substantially better than any other. However, in the previous five years, the study areas on the east coast were already losing significant numbers of people while the B.C. districts were still holding steady or growing slightly. Moreover, the population in the east coast Grenfell Health Region (which contains many of the communities we have studied) declined by 18 per cent, from 19,345 to 15,805 between 1991 and 2001, with out-migration of young people being a major component of this decline. A similar set of demographic trends has been observed for Newfoundland's Western Health Region, which contains the rest of our study area

communities, but also includes the southwestern part of the island, an area we did not research.

Why? In the late 1990s, much of rural B.C. experienced contraction in its important logging and wood-processing industries as a result of lumber duties imposed by the United States and poor markets for many paper products. In addition, depleted stocks of salmon and other commercial species caused problems in the fisheries. Although the coastal areas we have studied in B.C. often have significant tourist and aquaculture enterprises, these did not fully compensate and populations fell. The continuing influx of people to Tofino sets it apart from the other study communities. On the east coast, some areas appear in desperate condition, the exception being Charlottetown, southern Labrador, where crab fishing and, more recently, shrimp processing were successfully expanded after the cod moratorium and construction of the Labrador road contributed to population growth. However, Port Hope Simpson, a forestry-dependent community with a smaller fishing sector, demonstrates that the experience of Charlottetown (and Mary's Harbour) was not uniform in southern Labrador. Moreover, the completion of the Trans-Labrador Highway and a succession of substantial quota cuts in the crab fishery up to 2005 may accelerate out-migration in these areas if alternative employment opportunities are not found.

One of the known contributors to human stress is *financial insecurity*. The Statistics Canada Survey of Financial Security shows that, on a basis comparable to 1984, Canadian median net after-tax income of family units was virtually unchanged in 1999, although median net worth had risen by 11 per cent. However, significant evidence indicates increasing wealth inequality: family units in Newfoundland had the smallest median net worth, and the median worth of young couples across the country fell by 30 per cent, although median net worth of all families rose by 10 per cent. Moreover, B.C. was shown to "be home to both the highest average wealth in Canada and the largest gap between the richest and poorest households." There was no breakdown available for coastal communities specifically in these reports but it should be noted that income inequalities between rich and poor groups or areas have been identified in the population health literature as correlates of mortality and morbidity differences. Low educational attainment (measured by the percentage of the population with less than high school education) was similar in all our study areas and much higher than Canadian averages. In other respects the two east coast regions are notably worse off than those on the west coast. They show much higher dependence on government transfer incomes,

with median personal incomes more than $5,000 lower than in the poorest B.C. region and much higher unemployment rates. The Grenfell region on Newfoundland's Northern Peninsula experienced the highest out-migration of all regions and still fares worse on four out of five measures. Clearly, the high rates of out-migration have not left those still living in the areas with adequate employment and independent incomes. We conclude that, to some degree, people in coastal communities are finding that they have to "vote with their feet" and, where they cannot create new local opportunities for community and household survival, move to other places. The pressures on these coastal peoples are significant.

Can we say, however, that their health is suffering as a result of the multiple stressors that restructuring has brought to bear upon their lives? We know that the *health of communities* (as entities distinct from their resident populations) depends on the quality of their physical and social environments and can be measured in terms of indicators such as pollution levels, crime rates, population dynamics, employment and educational opportunity, family stability, and social capital and social cohesion. Anecdotal evidence suggests that community stress, linked to industrial change and economic uncertainty, has had negative *psychosocial effects*, including increased depression, dysfunctional family relations, and alcohol and drug abuse. Our work has identified community health as vulnerable to the impacts of restructuring on both coasts. Details are in our books and articles (see www.coastsunderstress.ca/publications.php).

Given this, it is perhaps surprising that people on both coasts expressed a high level of satisfaction with their communities, despite the unemployment and the extent of population loss. They valued the social relationships and qualities associated with the physical environment of their communities. The recent population health research literature has also emphasized the importance of social capital and social cohesion as indicators of community health and well-being and as social determinants of personal health. We found that community attachment was strongly correlated with community satisfaction. That said, we found on the west coast that residents in Tofino and Ucluelet were more optimistic about the economic outlook and social conditions in their communities than the residents of Port Hardy and Prince Rupert. Findings on the east coast suggested that other areas were somewhat more optimistic than those that were highly fishery-dependent and where the aftermath of the fishery crisis left them with greater loss. On both coasts people emphasized that more economic diversity meant greater buffering potential in an economic or resource crisis.

Our surveys also told us about personal health. Overall, all the communities reported poorer health than either the province or the country as a whole. Among the four west coast communities, the poorest health was reported for Prince Rupert and Port Hardy, the places most seriously impacted by restructuring. Likewise on the east coast, the poorest health was reported by those places with a longer experience of restructuring. We asked residents on both coasts how stressful they considered their lives as a whole, to rate seven specific sources of potential stress, and to compare their overall stress levels to a year ago. The percentage from the west coast reporting their lives as either not at all stressful or slightly stressful was quite high, at 55 per cent, with little variability by community. The percentage reporting that their lives were either considerably or very stressful was therefore correspondingly low, at 12 per cent overall, which was also quite uniform across the four communities. On the east coast, these trends were repeated with a small percentage of respondents across the three research areas rating their level of stress as considerably/very stressful. The overall percentage was lower than that reported for the west coast. Using the Canadian Community Health Survey data for a comparison with national and provincial statistics, we found that reported stress is considerably higher in Canada as a whole (26 per cent) and B.C. as a whole (24 per cent) than in our four west coast communities (12 per cent). While this result on first sight may appear counter-intuitive, given the socio-economic conditions and stressors in the communities we studied, it is consistent with findings from other studies that show lower levels of stress for smaller communities relative to urban centres. We were told by many survey respondents that the local environment was a key factor in mitigating individual stress: highly developed social networks among residents, a strong sense of safety, and an absence of the typical urban stresses of traffic and pollution were considered reasons for low stress levels. Easy access to wilderness areas and availability of clean water and air were also cited as environmental features that eased or prevented stress. All of these factors would hold for the east coast findings as well. People in these areas, while admitting that they were concerned with their financial situation and worried over the future of their communities, could somehow put these concerns into perspective and this translated into lower perceived stress levels.

Taken overall, our findings reported for demographic and income changes show quite profound effects for both east and west coast communities that are consistent with and plausibly attributed to restructuring processes and events. In terms of population

health, community variations in mortality and morbidity rates, when compared with provincial rates, are suggestive of restructuring effects even though direct attribution cannot be inferred from the ecological analysis. In combination our results mean that those communities on both coasts that had experienced the most recent and severe disruptions as a result of restructuring had both poorer health and greater mental stress.

LIVELIHOODS

People live the consequences of restructuring in their lives at work and at home, in their bodies and in their spirit. In our fishing and forest products chapters, we reflected that scale mismatches in policy (created with the nation and province in mind, but without adequate understanding of their impacts on local communities) result in benefits being directed away from local producers, who are then left to face the uncertainties and risks of a globalizing economy without the ability to generate many choices for survival. People also told us about key changes in income security policies, especially EI and workers' compensation, as well as factors affecting their livelihoods, including the kind and amount of unpaid work required (such as care of family members in the context of reduced local medical services), and the reduced availability of traditional subsistence resources such as fish or wood. These apparently disparate bicoastal economies share bitter experiences at the level of the households, and the human face of their struggle is seen in the health impacts of these changing dynamics: visible in the anxiety and stress caused by uncertainty. *We know from all our work that the health of communities as resilient places and as networks is negatively affected by a combination of various kinds of restructuring, although there remains surprising strength in these places and among these people.*

Over the past 20 years, the coasts have been seriously affected by resource degradation (the environmental health component in social-ecological health), changing resource management regimes, industrial restructuring, and related changes in employment opportunities within and between the fisheries, forestry, tourism, and service sectors. On both coasts the consensus is that the economy is not healthy and that the local economic situation is precarious. This crisis has been sharpened by a downturn in several sectors at the same time. We focus here on four major social issues: (1) changes in EI; (2) the informal economy; (3) diet; and (4) uncertainty, stress, and tension.

Employment Insurance/Income Assistance

At the same time as the fishing and forestry industries have been undergoing a process of restructuring and downsizing on both coasts, and tourism and aquaculture have been on the rise, changes have also been taking place in some support programs of critical importance to these largely rural, seasonal, and often relatively low-income women and men. In a high unemployment region, where the unemployment rate is greater than 13.1 per cent (as is the case with our east coast communities), shorter seasons in fish processing have made Employment Insurance (EI) regulations difficult for plant workers, and most tourism operators find it impossible to provide the required amount of employment for their workers. Tourist operators have had trouble attracting labour, and fish-plant workers are competing among each other for "stamps." The new entrant EI regulations (more than 490 hours of insurable earnings or benefits in the year before the qualifying year) also cause difficulty, making it very hard to recover lost eligibility associated with one bad year.

EI changes have also made it more difficult for unemployed people to qualify for retraining and educational support, and workers go to great lengths, often to the detriment of their health or family life, to try to qualify for EI and avoid the re-entrant trap.

On both coasts there is a strong sense that changes to EI and income assistance (IA) regulations have made it more difficult for people experiencing employment difficulties to access social support. Within the fishing industry, shortened seasons at fish plants and reduced commercial fisheries openings prevent many processing workers and some fish harvesters from qualifying for EI for the duration of the off-season. In B.C. new provincial regulations governing IA have also proved challenging, and some people face the necessity of having to sell off personal assets in order to qualify for IA. First Nations communities are also affected and face the additional challenge of being legally assigned to reserves, which were central locations for the fishing industry of the late nineteenth century but are now suffering the effects of a declining commercial fishing industry and remoteness from most other sources of employment. The provincial delivery of social assistance has served to undermine community cohesion and enterprise in Aboriginal communities even further.

The Informal Economy

What has happened to the role of the informal or subsistence economy in household livelihoods? This "unpaid" economy has been

critical throughout the history of settlement in rural Newfoundland and Labrador and in remote settler and First Nations communities in British Columbia, and such activities and support networks remain vital components of rural livelihoods. Subsistence and wage jobs are usually interdependent – subsistence activities stretch scarce dollars and cash is needed to fuel the subsistence pump, thereby adding to (or being instead of) money from social programs. Many subsistence activities, of course, also have a cultural and recreational value and are not just engaged in for livelihood purposes. We found that many traditional subsistence activities were alive and well, though some traditional opportunities have been eroded by restructuring. However, constraints on access to cash and to people with the skills and means to carry out such activities as house repairs or construction could seriously jeopardize subsistence in the future.

People still value going on the land and some still engage in a fairly traditional seasonal round of work – some paid and some unpaid. Environmental changes, however, threaten subsistence activity, and resource management policies further limit traditional access – these policies are often perceived to be inequitable. Some people lack start-up capital for subsistence activities, while others turn to subsistence activities when other livelihood options decline. The development of a business crafted out of subsistence activities is becoming more common on both coasts – bakeapple and partridgeberry jams and syrups for sale to tourists and export is one example of what is really *local diversification without government blessing.*

Diet

One common but usually unrecognized effect of interactive social-ecological restructuring has been dietary change – for communities and households and in school meal services, for example. Such impacts speak to problems of mismatch of risks and benefits of restructuring, and are yet another example of how local communities are bearing imbalanced risks as the wider provincial, national, and international economy restructures and as local diet solutions fall prey to ecosystem degradation. It is important to know the nature of such changes because of potential present and future human health (for better or worse) impacts, and because of the close relationship that exists among diet, community satisfaction, culture, and way of life. Food is a vital cultural expression. Food security, then, speaks to physical health and cultural and emotional health and well-being – and, by extension, environmental well-being

also since, in small local communities, usually a substantial component of people's activity involves growing (or protecting the growth of), harvesting, and preparing local foodstuffs.

A considerable amount of work has to be done on improving diets in rural communities. Some of the factors that contribute to poorer nutritional practices are inadequate dietary education, inadequate quality and selection of food by food suppliers, inadequate nutrition programs in the school. Alleviation of all of these is feasible and not particularly costly to achieve. It is, however, also important not to ignore larger issues that influence food purchase and thus consumption: adequate household incomes, the relative cost of different types of food, legislation of food quality, and the advertising of certain products. In this respect, broader pressures are beginning to have an effect on the quality of "junk" food, as the pressure to remove trans-fats in french fries, for example, becomes fashionable. What we know as a result of our work is that social-ecological restructuring has penetrated coastal communities right down to the level of food consumption and food security, having had a significant effect on traditional local diets and thus on the health of local communities. This is a fine example of the kind of unwitting cascade of effects that social-ecological restructuring has imposed on coastal communities over time, and it will take raised awareness at the levels of families, schools, municipalities, and provincial and federal departments to restore security to these places.

Uncertainty, Stress, Tensions, and Human Health

Life on the coasts has become increasingly stressful, to a degree mediated by household responsibilities, gender, and age and stage of life. Lack of stability and security in employment affects a person's ability to plan for the future, and many people talk about the mental stress associated with financial uncertainty. Mental stress is an important part of human health, but it rarely stands alone. The problem is the ongoing struggle to make ends meet. There is a strong correlation between healthy families and healthy communities. Families need economic stability in the form of secure employment opportunities and access to supportive community services and social networks in order to be healthy and resilient. Conversely, strong families are essential to promoting and maintaining healthy communities. Clearly, unemployment and underemployment due to resource-sector restructuring, coupled with reductions in social services and changes to Employment Insurance and income assistance regulations, are proving extremely challenging for many families in these coastal communities.

Finally, it is important to remember that food is more than physical sustenance: to lose local food production and local knowledge about foods is to endanger cultural as well as physical health, while producing unnecessary stress on household food budgets.

POLICY IMPLICATIONS

Our findings should prompt new thinking about how families cope with the collapse of one or more of their economic "modes." One of the conceptual problems people and their politicians have to face when coming to grips with the human impact of restructuring is that the political-economic focus on cash incomes and the prioritizing of per capita or household cash income as an indicator of health and success miss an important part of the story. Perspectives based on cash income reduce people to being inputs into a production process. That implies that individual incomes could be maximized by moving away from declining places. In this view, the effects on households, on the gendered division of work, and on intergenerational transfers of knowledge, culture, access to, and ownership of resource niches are ignored, and communities become disposable nodes in a production network.

People actually make decisions based on household and larger needs; their lives are made up of more than cash income, and their decisions are based on balancing many factors, such as caring responsibilities, community health, environmental health, cultural resources, familial connections, and traditional roots in communities. Taken together, these make up the strategies for decision-making that seek successful and healthy households and communities. Cash inputs into a family economy are put together with other inputs from the informal (hunting, fishing, barter, gift, labour exchange) economy and from state transfer payments in order to feed, house, and clothe a family. This produces a *household economy that is both productive and highly flexible.* That is why policy-makers need to keep in mind that disturbing that balance – through strategies that create flexibility for business firms by downloading rigidity from the firm to the household – will necessarily damage local communities. As post-industrial restructuring takes place in industry, what had been firm rigidities before restructuring have been removed – the kinds of protections and restrictions that unions and workforces used to be able to impose on employers have eroded to the point where they no longer are factors. Instead, industry has gained flexibility by imposing constraints on the working population, whether piecework, contracting out, or other strategies by which firms have been able to remain competitive in a global mar-

ketplace where cheap labour in developing countries forces industry to make cost-saving adjustments wherever possible. This new burden has been exacerbated by cross-scale and cross-sector lack of coordination – witness government cutbacks and cost-saving adjustment in the institutional (provincial and federal government resource management regimes and income and health-care regulations) infrastructures.

Work, *it must be realized, is about more than a paycheque; it is also a key element in a way of life for most coastal families.* Should the work fail, they will be losing not only their jobs but also their homes and community networks, and these communities may well disappear or be reduced to hamlets of temporary homes.

At the same time, we have discovered a remarkable resilience among coastal people, which is particularly striking in the face of scientific, industrial, and policy initiatives that have failed to nurture and sustain coastal communities. Restructuring of the various resource sectors has affected the availability and quality of local employment, community population numbers, family security and stability, and community social capital, while the concurrent restructuring of Employment Insurance and social assistance has, in some instances, actually exacerbated already challenging economic situations for individuals and communities. Sadly, it is also the case that state infrastructure, far from assisting and supporting communities as they seek to reorganize to be dynamic contributing partners in the Canadian federation, has in many cases made matters worse, following initiatives that are more likely to challenge and undermine the resilience of these people and the places they call home than to nurture what is a rich Canadian heritage of culture and place.

Education and the Future 5

While restructuring was a prominent feature of the late twentieth century and has occurred at the global, national, and local levels, not all communities have been affected in the same way. The characteristics of any given community and its inhabitants influence how people handle their circumstances, as do age, gender, and/or developmental stage.

On the east coast, the imperatives of efficiency and competitiveness have triggered profound changes within primary and secondary education as Canadian society develops a "knowledge economy" with which to maintain its place in the changing world economy. In the mid-1990s one part of the cascade of effects from federal efficiency measures was the emptying of provincial coffers throughout the country, which then created strong pressures for school board consolidation and reorientation of primary and secondary education to meet the needs of urban-based new economy firms for technologically skilled, flexible, and above all, mobile workers. The small rural school has been seen as an obstacle to this and the government of Newfoundland and Labrador has, over the past decade, proceeded to overhaul governance structures within the province's school system and accelerate the pace of rural school closures. In addition to widening the disparity between town and outport schools, this quasi-privatization of education has resulted in work intensification for the remaining school staff. Although the specifics of reform vary across the country, the general thrust of reduced cash, increased extracurricular workload for teachers and principals, and a strong sense of frustration with aging facilities and inadequate government support are all shared by schools throughout the coastal communities we have studied. Rigidities caused by lack of resources are making it very difficult for schools outside main urban areas to respond creatively to the training requirements of the new knowledge economy, and in practice these inflexibilities are op-

erating as increasingly serious constraints on education in coastal communities.

Most students now intend to continue their education after high school, thinking that a "good life" would be one with a good job, lots of money, and family and friends, and more rural school students than urban students think they would be able to have the education and career to which they aspired. At the same time, rural students see more changes in their world, such as fewer employment and recreational opportunities and more family members and other people moving away. More students in the rural communities expect to be living outside their home community – and even outside the province – after they complete their schooling. Rural students reported that one of the changes they perceived was that there were fewer teachers in their school, the result of fewer students in the schools rather than cutbacks in funding.

Performance indicators (including school attendance and completion rates, provincial exam grades, and participation in post-secondary school) told us that average rural school grades on provincial exams continued to be below the provincial average in 2002-2003. A lower level of male achievement corresponds to their lower levels of school satisfaction and higher dissatisfaction than their female peers. Nonetheless, the numbers attending post-secondary institutions have risen dramatically in the past two decades and rural youth are no longer significantly behind their urban counterparts, although there is still room for improvement.

Similar cost-cutting restrictions were also operative on the west coast. There, young people told us that, for the most part, their families were doing well when it came to meeting basic needs, but nearly 15 per cent indicated they experienced financial difficulties and employment problems, the latter important because a large percentage of students work for pay.

Given the time children and youth spend in schools, there is an obvious pathway to their health and well-being from the school environment. More than 50 per cent of west coast youth said that often or sometimes they "feel hopeless" or "unhappy, sad, or depressed." This sense of malaise was reinforced by the slightly under 50 per cent who indicated that they had "trouble enjoying themselves." Sadly, a number of coastal youth in B.C. felt that racism is a problem, with almost one-quarter of youth seeing problems of acceptance of people from different ethnic groups.

We also sought crucial information on youth and the problem of tobacco and drug use, which, most youth agreed, was a problem. There may be a link between this and the lack of varied activities for

youth. In addition, many felt there were not enough opportunities to be involved in the community. This makes it hard to get young people to stay in the area, since they feel that their contributions to the community are not valued. Overall, these west coast youth were not strongly optimistic about their futures. That said, we were encouraged to find that, in spite of the major changes in the economic and social life of this community over the past decade, there are signs of adaptation and resilience among the students. As on the east coast, educational achievement has improved substantially, with most youth planning to leave the community after completing high school and the vast majority of them intending to pursue post-secondary education.

Education can operate as a means of developing future skills that will enrich the employment potential of coastal communities, or it can function in such a way as to force out-migration. Such things as education in small-scale entrepreneurship, art and craft skills, hotel management, and the like build on cultural and environmental strengths and would contribute to keeping communities alive. Some programs that the B.C. schools developed drew on already existing skills and interests of the First Nations student population. The customized program, which is "still running and involving non-Native as well as Native kids, brings disparate groups together"; it is "one of those programs that kept kids in school." It is also one that might help to keep young people in their communities in the future, and its success invites a closer examination of "academic success," a concept that is understood all too often only in reference to the dominant culture.

Two other west coast programs for youth groups in school were particularly vulnerable to a combination of socio-economic restructuring and government policies of financial restraint reminiscent of that which Newfoundland and Labrador has been facing since the 1980s. One involves alternate learning and the other, special needs. Through programs like this, many youth have gained confidence from people who expect them to succeed, have achieved an awareness of their earlier problems, and have gained a sense of personal satisfaction that makes productive citizenship possible. Such programs alone will not promote an active involvement in citizenship or create community leaders, but they demonstrate the way ahead and show that such youth can help others on a one-to-one level. That is a direct pathway to mental well-being.

As the economic situation of coastal communities worsens and increasing numbers of students and their families fall into poverty, the effort to focus attention on student needs becomes increasingly

urgent (Maxwell, 2003). Unfortunately, with increasing class numbers and fewer support workers assigned to classes and community liaison, the opposite scenario is developing in some areas, and mental health and well-being, not just for youth but also for those who care for them in and outside the home, are suffering in the process. As supports are withdrawn, teachers face a greatly increased workload; students, in turn, receive far less attention and help than in previous times. Teachers, and thus youth, are also affected by the recent emphasis on accountability. We saw many innovative school programs for youth, in which issues of personnel, workloads, and budgets combine to present serious challenges to schools, especially to special services such as working with special-needs students and outreach to the community of which the school is a part. Indeed, a number of students on both coasts expressed concerns about their academic preparedness, and many suggested that the lack of school resources resulting from reduced enrolments was a key reason why they were not receiving the education they felt was necessary.

Given the similarity of educational issues on both coasts, we sought to understand the attitudes, desires, and actions that fuelled what we consider to be two related pathways to the health of youth: (1) the impacts of social and environmental restructuring on health, life, and work, as well as on development and planning for coastal youth, for which we interviewed people in five communities on the west coast; and (2) the impacts of that restructuring on the health of youth, using a northern Newfoundland community for our case study. Our results from both coasts have proved to be sufficiently consistent that we are confident that we are addressing national (systemic) problems and potentials. Where there are coastal differences, we indicate them.

In coastal communities, health is related to a number of complex and interacting factors. For young people on both coasts, their major concern is social and emotional health, although "place" (landscape, nature) is also important. Peer and family relationships, as well as schooling and education, are major contributors to youth well-being and are closely linked to overall family and community health, especially in smaller, remote communities where access to services is limited. It is clear that restructuring of all kinds has influenced the emotional and mental health of youth, often in conjunction with their social health or their relationships with family and friends. Negative social relations are often closely connected to poor emotional and mental health in youth, and can jeopardize both their short-term and long-term health.

The pathways between these health issues and young people are direct. On the west coast, they saw economic difficulties as linked to marital separations, divorce, estrangement from or fights with parents, illness, and substance abuse. On both coasts, youth spoke of lack of services and youth-centred resources further affecting their daily lives. They expressed great uncertainty about their future because decisions about what they do, and where they might live in the years ahead, are closely tied to the social and economic conditions in their communities.

However, a major theme that came through strongly in all our interviews was that attachment to place among youth was strong on both coasts. Attachment to community, rooted in part in love of the rural landscape, affords a sense of security and freedom that many youth feel they would not have in an urban setting. Nonetheless, they clearly recognize that urban settings present more educational and employment opportunities and, indeed, in Newfoundland many of the youth we spoke to feel that they are being "pushed" out of the community because of the uncertainty about the future of the community and lack of employment options. Young people with a strong attachment to the place and the culture of the Northern Peninsula appear to be under tremendous pressure to reformulate a new sense of self and identity as they attempt to start a new life elsewhere. Not only did some of the students express concerns about the quality of their current education given the changing context within their community, but some suggested that even though they are preparing for college or university it was uncertain how many would actually complete a degree because of the economic costs of attending university.

Two interrelated themes have emerged from our interviews with youth on both coasts – "uncertainty" and "mobility." The young people's discussions of their current educational and work experiences centred on issues of uncertainty regarding their preparedness – academically, socially, emotionally, and financially – for post-secondary education. They were unsure of the future and what it would hold for them. The issue of mobility was a second major theme. The mobility of teachers and others within the community was one element affecting the quality of their education, as we have seen. The students' discussions about their future job and career opportunities also centred on the mobility that was certain to be a part of their own futures – mobility related to pursuing their education in order to obtain future employment, and mobility related to obtaining employment of any kind.

Consistently recurring major themes on both coasts, then, include: (1) staying in the community versus leaving it; (2) the implementation of "possible selves"; and (3) cultural identity and self-awareness. The health and well-being of these youth are affected by what is presently available to them and their assessment of how current opportunities stack up against opportunities for youth in other places. Many of the youth love their home communities and the relatively unpolluted environment. This strong local tie has both problematic and positive aspects. Some participants are aware that these very ties to their communities limit the choices available to them. They are struggling with whether to focus on staying or leaving. The focus needs to be on generating alternatives, keeping options open, and offering practical support with educational planning, work experience, and economic management. In spite of the positives associated with the close relationship to the physical environment, many youth commented on the lack of options provided in communities that are under transformation. There is no doubt that excessive alcohol and drug use is a major health risk for young people, in part because it is associated with other high-risk activities, including drinking and driving and unsafe sex. Youth are generally very aware of the risks and benefits attached to health and lifestyle choices. They know the importance of nutrition and fitness and the risks that accompany alcohol, tobacco, and substance abuse. Some youth are very aware of and interested in environmental and community "health." By highlighting the importance of the natural or physical environment and the interplay between the social and the physical or natural worlds, this work has opened up and pointed to a new direction for much of the research on youth and health, and sets the stage for more integrated and inclusive frameworks for future health research.

POLICY IMPLICATIONS

In the current climate of economic uncertainty and socio-political restructuring, it is vitally important that young people participate actively in life-career planning. The situation is particularly urgent in communities on both coasts, which have been devastated by recent fishing, forestry, and mining closures. These youth face challenges associated with living in areas where there are dramatically changed economic bases, limited work experience options, high unemployment, isolation, and other factors limiting their knowledge of and exposure to the world of work. In addition, young people in families and communities experiencing stress related to social and economic restructuring are at high risk for injuries and

health problems. Substance abuse, peer violence, depression, and high-risk sexual practices are behaviours associated with the effects of societal restructuring and the resultant family stress, economic hardship, and reduced community services. Communities and families are deeply concerned about the diminishing educational and work opportunities available for their children.

Our findings have several implications for policy and practice in mental health services, education, and community development. From the individual and focus group interviews and the descriptions of supports, issues, and challenges in life and career planning we were offered, several themes and sub-themes emerged. There are limited and decreasing opportunities, information, and contacts related to work or career development and planning – most youth expect they will have to leave to pursue work and/or further education. Not surprisingly, then, youth feel disregarded or "disenfranchised" in the decision-making process. We need to be aware of the cultural and gender role differences that exist among youth with respect to expectations for life and work choices. We also need to be aware of the strong relationships and feelings of attachment to the community and the people in it that most youth (First Nations and others) feel, but most First Nations youth demonstrate a strong cultural identity that goes beyond affection for place and is rooted in a sense of heritage stretching back thousands of years. Mentoring and role models are vital for teenagers as important sources of help and support, but the consequent stress on families, teachers, and community professionals is evident under conditions of diminishing population and resources.

Although the discussions with the youth revealed that they felt very uncertain about their academic readiness and about their futures – where they might work and live and for how long – the students were certain that they needed to work. Many indicated that they were not going to "sit around and do nothing" or they were not going to go on welfare. Some were somewhat hopeful that forestry and fishing would be renewed and that other industries – including tourism – would grow, and that there would be spinoff effects for the community in terms of younger people working and living in the community. Other students were less than optimistic about the future of the community and suggested that in the future it would simply be "a community of old people."

The implications of mobility for the youth are numerous. As many of the youth noted, it is expensive to constantly have to move and to come back and forth to the community. These economic issues may affect the youth's ability to "get ahead" economically in the

future. In addition, there are potentially some very serious emotional and health-related issues connected to this mobility, especially involving attachments to family and friends and the social supports that are important for health and well-being. As we have seen, these challenges to family connection appear to have put First Nations youth at particular risk. It is vital that we address these issues of uncertainty and mobility when generating solutions to the effects of restructuring in coastal Canada.

Finally, youth themselves are aware that they live in uncertain times and are ambivalent about how to deal with this. Some simply have decided to leave for a better chance elsewhere; others hope against hope that things will improve and they will be able to live in the places they deeply love. First Nations youth, despite long-standing problems, have an enormous commitment to place, and some government resources now being targeted at First Nations may help them, but they are struggling, not knowing how to cope and whether to go or stay. For those who want to leave, we need to understand that dislocation will have dangerous effects if the transition is not well managed. For those who wish to stay, and they are the majority, these young people, and the places they live in and are devoted to, constitute an enormous strength for the future if the wherewithal to help them, and to help the communities they love, can be found. We do not think Canada can afford to write off its coastal communities. It is time, therefore, to address the challenges that the youth of coastal communities face, and that Canadians need to face with them.

New Options 6

We examined four possible future options, as a sample of what is being considered: (1) aquaculture, (2) tourism, (3) transportation, and (4) a few local initiatives.

AQUACULTURE AND ENHANCEMENT

In the post-industrial twenty-first century, new opportunities tend to be sought either in the service sector or in transformations of old resource-based industries into putatively more advanced forms of those industries, involving some kind of primary manufacturing. The production of hatchery fish for release in the wild, farmed fish, or the protection of very young wild fish are major initiatives of this kind and are spoken of by government as akin to development beyond primitive hunter-gatherer techniques into those of agriculture. Governments also argue for other strengths, such as producing stable jobs with good opportunities for advancement, and for the subsequent "products" of these new endeavours as being useful substitutes in the marketplace for now-endangered or commercially extinct stocks. On both coasts, then, enhancement and aquaculture have understandably become very popular with federal and provincial governments. There are, however, warnings of potential difficulties that require government attention and arm's-length scientific testing. We summarize them here and point to our main publications for the broader discussion and scientific evidence we produced, which is genuinely arm's-length, having been funded neither by industry nor by government-backed departmental funding.

By the 1970s it had become apparent that salmonid stocks were in peril and in 1977 the Department of Fisheries and Oceans initiated the Salmonid Enhancement Program (SEP). Hatcheries were built to attempt to strengthen stocks by effectively short-circuiting the natural losses that occur between when the eggs are laid (spawning) and when the fish head out to sea (smolt migration). However, the survival rates from smolt release to spawner return re-

main consistently lower than that of wild salmon, and we were unable to solve the problem. In short, hatcheries have not yet proven their value.

Turning to aquaculture, we start from the position that it is not a novel idea. On the west coast, for example, aquaculture is not new, even though the sector may be, since coastal Aboriginal peoples intensified their production of salmon, various kinds of shellfish, and seaweed through enhancing the reproduction and productivity of these resources, as well as through innovations in processing and storing them for year-round use and trade. Productivity was enhanced through maintenance and improvements in the flow and quality of salmon spawning streams and beds, through transplanting salmon eggs from one stream system to another, and through use of fish weirs, which not only helped to harvest fish but also to monitor them and ensure that enough passed upriver to reproduce. Clam "gardening" (see Woods, 2005) was another practice developed in some areas, probably thousands of years ago, which increased the numbers and productivity of butter clams and other species. Intensification of plant products included selective harvesting, transplanting, weeding, clearing, pruning, and in some cases fertilizing. In effect, First Nations "farmed" the sea – a process of primary manufacturing, as is agriculture – and did not just pursue primary extraction. Management was linked to ownership and stewardship patterns that enabled individual families, clans, and lineages to maintain constant control over production and to reap the benefits of their labours directly. It was also focused on local indigenous species, not on exotics, and the managed areas were in situ. These are important conditions of the long-term success of First Nations in aquaculture.

Today, west coast salmon aquaculture plays an important role in the local economy, providing employment to residents both on fish farms and in processing facilities owned by aquaculture companies, and some people are hopeful that this industry will expand to provide more employment. However, modern aquaculture has markedly changed the "ecological footprint" of the industry in coastal B.C. In parallel with DFO's Salmon Enhancement Program, no less than five federal government departments and eight provincial ministries have been involved in regulating and guiding the development of British Columbia's aquaculture industry since 1972. By 1985, the B.C. industry was made up of 100 small businesses; today, the B.C. Salmon Farmers Association represents 11 producers, of which five multinationals control 81 per cent of production. Prior to the Norwegian-sponsored restructuring of the

industry, B.C. salmon farmers were in the business of raising and selling Pacific stocks, specifically chinook and coho. Today, Atlantic salmon is the favoured species for aquaculture in B.C. (82 per cent of production). It is B.C.'s most valued legal agricultural export crop, with wholesale returns three times that of the entire Pacific salmon capture fishery. Farms earn 89 per cent of the wholesale value of their product while fishers only realize 15 per cent.

On the east coast, Atlantic salmon aquaculture has been practised since the 1980s in coastal Newfoundland and New Brunswick. Atlantic salmon continue to be the major product of the aquaculture industry on both coasts, although bivalve aquaculture has been growing rapidly and in Newfoundland there are now considerable efforts towards commercialization of cod aquaculture. Blue mussel aquaculture has been the most successful of the cultured shellfish, but since the 1980s the Newfoundland government has encouraged scallop aquaculture development due to the ready market for scallops in the U.S. The techniques currently used for salmon and cod aquaculture grew out of methods designed to optimize use of precious resources or attempts to reverse their depletion.

The private economic benefits of aquaculture are therefore obvious, while the industry's externalities or hidden costs are rarely discussed. Externalities include government subsidies (job training, infrastructure grants) and nature's subsidies. Ecological costs include but are not limited to: genetic implications of escaped Atlantic salmon in British Columbia waters; the potential for disease and parasite transfer to and from wild salmon stocks; development of antibiotic-resistant pathogens; organic pollution from uneaten food and feces (which can lead to diminished ecosystem functioning); questionable methods of predator (marine mammals and birds) deterrence; and unsustainable extraction of marine protein raw materials, leading to depletion of fish stocks used as fish feed.

TOURISM

One of the biggest hopes for the future on both coasts has been the development of tourism. We point to the example of Tofino on the west coast of Vancouver Island where the economic outlook is relatively positive. There is no doubt that Tofino is experiencing substantial growth in tourism-related employment in accommodation, food, and beverage services. Employment in the tourism industry in Tofino has risen from 190 in 1996 to 305 in 2001, an increase of over 60 per cent. While the tourism sector is now fundamental to Tofino's economy, some feel that the community is overly reliant on tourism, while others believe Tofino's economic

success is rooted in economic diversification. More broadly, people on both coasts have started to think in terms of a range of opportunities that, taken together, provide some hope. They argue that through new Internet-based businesses and tourism ventures, in combination with forestry-and fishery-related work, their economic outlook could be bright.

There are downsides here, too, of course. Many of the jobs associated with traditional resource-based industries often paid better than tourism; they also used to guarantee seasonal employment and a sense of security and stability to workers prior to restructuring in the 1980s.

The relatively remote location of many communities makes them jump-off points from which to gain access to wilderness areas, wildlife viewing, and sport fishing. Such opportunities are something of a double-edged sword, however. The remoteness of many communities has served to protect their culture while making it difficult to get a significant volume of tourist traffic. Finally, the persistence of limited access to trade and professional training has restricted the capacity to diversify into the hospitality and cultural industries. On the east coast (the Great Northern Peninsula's Viking Trail and Gros Morne Park and in southern Labrador) we found similar kinds of development and similar concerns. In most places we were told, "tourism can't replace the fishery" as owners and employees struggle with a short season and low earnings. As one person said, employment in tourism is "OK for a second income or students" but won't keep young people from moving away. Others emphasized that tourism can only succeed if the other sectors do also, as it will be local business that will maintain the restaurants and bed-and-breakfast operations in the off-season.

That said, the manner in which the Haida and Parks Canada operate the National Park Reserve of Gwaii Haanas in Haida Gwaii (Queen Charlotte Islands) is an object lesson in what can be done. There, Haida "watchmen" (often local Haida youth together with older people) reside in the abandoned First Nation villages in the area and teach visitors about the local culture. The park limits the impact of tourism on the fragile ecosystems within it by limiting the number of visitors at any one time and requiring them to take wilderness instruction from park officials before entering the area. The park is run by an effective partnership between the Haida Nation and Parks Canada and could well serve as a model of what can be achieved, given goodwill and intelligent forethought.

TRANSPORTATION: A CASE STUDY FROM LABRADOR

For industrial diversification including tourism development to succeed, appropriate infrastructure is required. On the west coast, road and ferry services connect most of the communities we studied, but on the east coast, until very recently, no road linked the Labrador communities from Red Bay to the regional centre in Goose Bay. Although it is too early to provide a full critical assessment of the impact of the road, we note certain trends. Shellfish products are now largely trucked from the area, while processing plants can now truck in the essential inputs for the production process. Whether or not the road will be the hoped-for catalyst for development remains uncertain, depending to some degree on what is expected of future "development." For some, including government, development is synonymous with economic growth and the exploitation of new resources. For others, real development means the enhancement of people's capacity, within the bounds of a given geography, to have greater control over their lives.

So far, the hurried construction of the new road has squandered the opportunity to develop the kind of infrastructure and expertise in the region that will be needed in the long-term maintenance of the road. There is no doubt that the environmental impact of road construction has been severe and negative. We found that 45 of the 47 culverts were not embedded with natural stream substrate with the minimum of 30 cm, as stipulated in the Department of Fisheries and Oceans fish-stream crossing guidelines, and many presented barriers to fish movements, resulting in fragmentation of stream habitat and loss of spawning and rearing habitat. We explored the economic obstacles to proper culvert installation and concluded that the most common and cost-effective conduits in road construction are the round 800-900 millimetre culverts, which cost about $200 per metre (or about $4,000 for the average stream crossing). The province, with its limited budget, funded the culverts and understandably required bottomless arches or bridges to maintain the original stream bed only when DFO insisted. As a result of our work on culverts, a partnership with the Labrador Métis Nation (LMN) was formed and led to high-level meetings with DFO, which undertook further studies. Five problematic culverts were reinstalled in 2003, the designs for stream crossings of Phase III of the Trans-Labrador Highway were changed in some instances, and LMN fishery guardians have been trained to ensure correct installations.

LOCAL INITIATIVES

It is imperative that governments break the old mindset of single-industry growth as a solution to the survival of coastal communities. Coastal communities need to get away from dependence on just one sector. Diversification is essential if flexibility is to be achieved, and coastal residents certainly understand this and that integrated planning between developing sectors is essential to long-term social-ecological health. We selected a few of these local initiatives, to illustrate the richness and creativity that exists in these places and to support them as they build new strategies that work at an appropriate scale and out of a deep understanding of local social and ecological conditions.

Community adjustment strategies have included attempts to get more involved in fisheries management and stewardship. Efforts have had some success but are limited by a number of barriers, particularly relations with government (e.g., DFO) but also limitations in community capacity, finances, and ability to work together within the community/region. However, "a demonstrated sense of resource stewardship, commitment to an identified geographic area, a core of dedicated individuals with invaluable local knowledge, and organizational experience in fisheries projects . . . represent a foundation to build upon" (Vodden, 2002).

It is well recognized that inter-sectoral collaboration is essential if we are to promote the social and economic health of our rural and remote communities. Such collaboration appears to be alive and well at the community level in Port Hope Simpson: many local agencies have worked to support the Moulder of Dreams pottery workshop, which, over the past seven years, has provided a vocational opportunity for members of the community who suffer from myotonic dystrophy. If such collaboration is lacking at the level of government, however, projects of this kind face enormous obstacles. Small businesses in relatively remote areas are hard to get going; those that also carry a labour force that suffers from a disability are even more difficult to develop to the point of self-sustenance. Primary health care and health promotion cannot be separated from employment generation and rural development initiatives if we are actually to achieve greater equity and to promote the resilience of our rural and remote communities. Moulder of Dreams is a perfect example of the kind of project that has the capacity to promote health *and* the economy in this and other communities.

POLICY IMPLICATIONS

Aquaculture

The ultimate message is that the ecological issues facing industrial salmon farming (as in most extractive industries) are physical manifestations that parallel underlying social imbalances. To focus solely on the ecological issues is to treat the symptoms and ignore the disease. Invariably, contemporary coastal communities today have welcomed aquaculture development initially, but in recent years it has had a very bad press on the west coast as the industry profile changed from large numbers of small-scale, horizontally integrated independent local producers to fewer vertically integrated multinational companies. Unlike the sustainable aquaculture of First Nations or that of earlier small-scale producers, such as in the cod farming based on the traditional east coast trap fishery, the current sector is being developed along the lines of international agribusiness, with efforts intensifying to reach major economies of scale. The aquaculture industry is now a powerful agribusiness with formidable lobbying power commanding a significant presence in government policy development. There is real fear on the west coast that aquaculture development will lead to loss of access by local people to their usual fishing grounds; there are also concerns over pollution and damage to wild stocks.

Government need not abandon aquaculture, but should not fall into the old trap of going too fast and with inadequate understanding of what is happening in order to solve local employment issues quickly. More arm's-length science is needed before some aquaculture can be deemed safe – or otherwise. Moreover, the "agricultural" model that government is following is not necessarily the best one. It is essentially an agribusiness model, used for migratory species about which we do not know enough and in which economies of scale have been raised to the global level before our technologies are sufficiently developed to be environmentally secure and before the products of this model have been ascertained to be safe for human consumption. Smaller-scale agriculture may well be more effective, efficient, and safe, providing local employment and local learning. First Nations have proven this model to be environmentally safe and workable over the long term.

Tourism

Tourism provides service-based employment, which is a weak way to diversify local economies because it is tied to short-term seasonal

projects that depend on market conditions and the weather and because its desirability can be questionable given ongoing problems with environmental and wildlife protection. On both coasts, tourism-related employment is also problematic, at least in isolation, since it is generally very low paid and the season is short. Indeed, on both coasts, tourism operators often have trouble finding workers, even while unemployment rates remain high, and labour shortages continue to be exacerbated by EI rules.

As tourism takes hold on both coasts, there are concerted efforts to "sell" the beauty and history of these places both nationally and internationally. This is reminiscent of Whitson (2001), who has written about the rise of "consumerism" in rural and remote locations, noting that business groups from urban Canada and other countries have turned their eyes to rural communities that can provide world-class recreation and tourism destinations. The resulting gentrification of the rural countryside is often seen as leading to a lack of affordable housing for local residents, with municipal services aimed at supporting affluent newcomers while local young people struggle to make ends meet in low-paying service jobs. Finally, tourism is an industry that can, unless very carefully handled, self-destruct. There is a troubling lack of ecological concern in terms of protecting the beauty that has brought tourists to these areas in the first place. As things stand on both coasts, tourism is seen as a necessary but not sufficient condition of ongoing community resilience. It has the advantages of significant degrees of local control, but the disadvantages of short-term employment and the instability consequent upon seasonality and consumer tastes.

Coastal community residents on both coasts are aware that tourism can only be a complement or supplement, not an alternative, to traditional resource employment, since it alone cannot sustain families and communities. Many people voice concern about the quality of available tourism employment opportunities, and several west coast interviewees explained that such jobs, being seasonal and mostly low-paying, are not ideal for people raising a family or trying to buy a house. On both coasts it is becoming very clear that some services that tourists use in the summer (hotels, restaurants) depend for their long-term viability on year-round business traffic. It is also clear that visitors wish to see living communities and culture, not a place that has become a theme park or that has returned to "wilderness."

Transportation

While initiatives like the Trans-Labrador Highway are essential in this day and age, it is important to consider their human and environmental costs. Misalignment in the form of environmental risks to fish habitat need not have happened if due caution had been observed, and such damage is likely to have negative impacts on tourism. It is also important to maintain consistent policies towards all transportation services in this, as in any, remote area.

Local Initiatives

With sustained and adequate government support to supplement the enormous volunteer contribution from the larger community, Moulder of Dreams, described above, is a good example of a local initiative that has the potential to become a model for other communities, particularly those in rural and remote areas, that are grappling not only with major structural changes in their economies and with out-migration of youth and young families, but also with aging populations and high rates of disability. Sadly, in 2005, the funding for Moulder of Dreams had been – at least temporarily – discontinued, and we hope to hear soon that enhanced and sustained funding and support will be forthcoming. Projects like Moulder of Dreams are important models that should be supported and talked about with pride at the national level, because they have the potential to play a central role in Canada's efforts to reduce health and employment inequalities between rural and urban areas and to enhance primary health care and health promotion across the country. They are worth supporting, and they are worth boasting about.

Overall, we found many examples of creative thinkers out there in coastal communities and many good examples of resilience that governing bodies at all levels could draw upon to promote reconstruction and stewardship of resources, local environments, ecosystems, and social systems: in short, social-ecological health. At the same time, we have identified a real danger that governance structures will do more to hinder than help: there are serious misalignments of approach, with government thinking more along traditional resource-based industrial multinational capital lines in the hope of quick fixes and spectacular statistics. This kind of thinking demonstrably does not work. There must be joint understanding and agreement by coastal communities and governments on what development paths are appropriate, what supports have to be in place, and what pitfalls can be expected. So long as opportunities

are heading in the right direction, it is wise for communities and their governments to hasten slowly.

In the past, restructuring led to the destruction of a functioning social-ecological relationship on both coasts among people, their local environments, and their economies. In the future, the only certainty is more change. It is therefore incumbent upon us, as stewards of our environments and our communities, to make sure that change, when it comes, is for the better. For example, seasonality used to be a strength, and there is no good reason that this should not also be the case in the future, provided that any future interactive restructuring recognizes the potential for positive links that can be established between seasonal pursuits and economic and ecological diversity. This kind of interaction was once the way coastal peoples lived and their communities flourished, and it needs to be recaptured in modern terms as we seek recovery of ecosystems, communities, and the interactions between them that can promote the health of society and the environment. Examples of co-management, such as we saw for Gwaii Haanas, are worth implementing elsewhere.

Transportation infrastructures can enhance or damage (perhaps even destroy) the social-ecological balance of a region: it is up to us. Tourism may, with infrastructural support and residentiary discrimination (that is, if its footprint is not too great and not too damaging), provide a decent livelihood for some and pleasure for countless visitors. Aquaculture and enhancement of the current damaged marine ecosystem can be made to serve all of us well, rather than to damage ecosystems and generate further economic inequalities in a local area. New opportunities in coastal communities are needed, and welcome, but they must be wise.

New Modes of Governance in the Coastal Zone 7

MARINE GOVERNANCE

Management of resources needs to be genuinely social-ecological, which means that to manage a resource we need to manage the actions of its top predators – humans. By extension, we also must seek to match governance practice to ecosystem function and the lives and life cycles of people and communities. Thus, to target only individuals, rather than households and communities, is to produce serious unintended consequences and to fail to address the fundamental issue of community survival. Given the problem of resource degradation currently confronting Canada's coasts, resource management must be for recovery, not for sustaining the present misery. It is unclear to what extent actual recovery is possible but, given the global state of many resources, taking this as our goal is appropriate not only on Canada's coasts but also globally. Global competition has increased the need for flexibility in resource-extraction firms, but such firms have achieved this, unfortunately, by effectively reducing options (and hence flexibility) for people at lower levels of the state system – one such example is the practice of contracting out, which leaves firms flexible but workers insecure. This is particularly problematic for communities that rely on seasonal employment strategies because, over a long history and up until very recently, they could always rely on having the flexibility that allowed them both to survive and to make seasonality a strategic strength.

It seems that such problems have existed in government management of marine resources. Today, similar problems of high-level flexibility in finance, labour management, infrastructure adjustments, interpretation of regulations, and issues of accountability and transparency have proliferated in our governance structures at federal, provincial, and municipal scales, and the result has been a

reduction in flexibility further down the system. This can have serious unforeseen consequences. For example, the hierarchical and rigid procedures of the former DFO regime resulted in a series of governance actions that, paradoxically, drove the groundfish fisheries to commercial and near-biological extinction. With this example before us, we examined new oceans management policies, focusing on the issue of species at risk and the problems and potentials of Marine Protected Areas (MPAs) as one possible approach to conservation. These different approaches are all-important tools in ecosystem conservation and fisheries management for the future, and should be thought of as complementary to one another.

Canada's Oceans Act and associated documents purport to lay out a strategy for the future management of Canada's oceans. It is important that the Canadian state maintains its overall responsibility for management and not effectively hand it over to particular groups of vested interests as some quota management schemes have done in the past. The resulting social-ecological patchwork management and recovery approach this can produce is unlikely to ensure sustainable management, let alone recovery. At the same time, monolithic, centralized management based on single-species assessments and policies with inappropriate spatial and temporal management scales also don't work. We could begin to achieve an even-handed, multi-layered, and effective Integrated Management regime if the following strategies were pursued:

- attention to habitats, species interactions, and ecology;
- investing in recovery rather than sustaining misery;
- developing the social and economic structures needed for effective co-management;
- strategic identification, development, monitoring, and ongoing adjustment of spatially and temporally appropriate management initiatives;
- managing for multiple generations of people and fish, with careful attention paid to the question of recovery *for whom* and a goal of promoting the health of people, communities, and environments.

This will happen if, and only if, there is genuine and equitable representation for stakeholders from all levels of interest and if shared goals go beyond the purely short-term environmental, social, political, or economic points of view. Thus, the goals of conservation, stewardship, ecosystem health, human health, and community health, as well as scientific and technological imperatives and security concerns, all need to be interwoven together.

We can use both the knowledge of species-at-risk hot spots and the protective practices of MPAs in the short run, while preparing in the long run to provide a highly flexible method of restoring lost ecosystems based on the informed choice of stakeholders. In all discussions, issues of access, ownership, and food security for humans will also need to be considered. Managing Canada's oceans means managing the actions of Canadian users of the oceans. For this to be effective, it is important that managers understand the goals and interests of various stakeholders and also have a firm grasp of the scientific knowledge of the ecosystems involved, including different forms of knowledge and an awareness of crucial gaps in that knowledge that can seriously affect stock assessment. Managing all of this will involve bringing together the various levels of interests involved so that they can work together, discussing and negotiating their differences. Only then can the integrity of marine ecosystems be at lesser risk of damage, and only then can managers ensure that the risks and costs of using Canada's oceans are not paid by one set of stakeholders while the benefits accrue to another.

Canada's Oceans Act and associated strategies signal growing institutional awareness of the problems of disturbed ecosystems, but much less awareness of the social complexities involved, which cannot be considered separately from new forms of ocean and coastal management. New initiatives will have to consider social health and ecological health in tandem, as interactively related phenomena, which we refer to as social-ecological health (Dolan et al., 2005), and will therefore have to use co-management structures of some form. In Ommer and Team (forthcoming), we have discussed all of these features and identified strengths and weaknesses of the suggested strategies for the future. The summary of approaches we offer here provides ways to evaluate what is "in play," when we recognize that there are rich flows of benefits – spiritual, cultural, ecosystem service, social, ecological, and economic – from healthy coastal ecosystems (for more detail, see also Vodden, forthcoming). When we compare these potential benefits with the cost to future generations of non-sustainable activities, it becomes obvious that whatever we do must not compromise the productive and regenerative capacities of marine ecosystems in and for the future. Meanwhile, current management practices – often based on the perceived inevitability of the fiscal imperatives justified in conventional discounting – ensure that we continue to deplete marine ecosystems. At the same time, such practices and the costs they entail will preclude the level of reinvestment in natural and social capital needed to compensate for the past 150 years of overharvesting.

GOVERNANCE IN THE COASTAL ZONE

In this last section, we turn to the challenges of landward management and of the land/sea interface. Some management examples now being tested in different parts of coastal Canada illustrate the challenges in this domain.

We looked at some of the resource management options that coastal communities have considered as they seek to come to grips with the changing socio-economic, environmental, and political conditions that have affected their terrestrial and land/water interface ecosystems. Interactive restructuring has occurred at all levels and on multiple dimensions and it is now the case that, at the national level, this restructuring is being driven to a significant extent by various changes in markets and economies at the global level. While international restructuring is beyond the scope of our study, we need to be constantly aware of its existence and recognize it as part of the driving force behind social-ecological distress, as seen in the over-exploitation of the world's oceans and the destruction of the Amazon tropical rain forest, for example. This restructuring and the damage it has caused have been driven by the industrial and fiduciary agendas of transnational actors – transnational corporations, banks, and their various instruments, such as the International Monetary Fund and the World Trade Organization (WTO). There is little in the way of transnational governance institutional capacity or autonomy that can offset the economic agendas of the large banks and corporations. The United Nations and transnational non-governmental organizations (NGOs) are without the necessary instruments of adjustment with which to alter any concerted global economic developments, and structures like the WTO are essentially under the influence of the developed nations and the major corporations that these countries often serve. Particularly since the early 1970s, national governments have become increasingly sensitive to the requirements and needs of the global economy, and much of their political-economic strategy now falls within the rubric of a global competitive business trajectory.

Canadian policy restructuring has affected our study areas in several ways, interacting with industrial, environmental, and social restructuring. Nationally, in the context of deficit fighting and an ethos of increased reliance on the private sector (both driven by the requirements of globalization), we have seen that policies that traditionally supported rural economies and communities – including, for example, federal-provincial transfer payments, rural development initiatives, and unemployment insurance – have been significantly

eroded. Regional economic development programs have been replaced by community economic development and by sub-provincial rather than multi-province "regional" initiatives. The result is that struggling communities are left to find their own solutions. While often seeking to be part of the problem-solving process, they also have to deal with depleted resources, cutbacks in essential transportation services, and market shifts that, taken together, have combined to undermine rural communities and industries, as we have shown in detail in our overview volume (Ommer and Team, forthcoming) and other publications. Political restructuring has reconfigured welfare state entitlements to benefits, such as EI, social assistance, and workers' compensation, and to services, such as health care and education. While health-care restructuring has sometimes increased the range of services available in rural areas, centralization and escalation of user fees for health services have hurt many communities. In practice, most of the restructuring in the governance of health care has been influenced more by the biomedical model than by social determinants or ecological health. Consolidation of education has been an ongoing concern in rural communities.

There has also been significant deregulation and re-regulation of resource access. The traditional resource sectors of forestry and fishing have both been reconfigured through new efforts to change the rules affecting resource access in such a way as to privilege corporate over community interests, often in the name of resource sustainability. In fisheries, licensing costs, privatization of public infrastructure like wharves and catch monitoring, professionalization programs, and the spread of individual quotas and individual transferable quotas are limiting access, driving up the cost of entry into the industry, and facilitating the concentration of ownership and control over the resource and the industry as a whole. In both fisheries and forestry there are competing interests between sectors (e.g., inshore, offshore, subsistence; pulp, sawmills) and between large companies and smaller operators, which come into play in terms of resource management. Such changes in resource policies both shape and are influenced by industrial and environmental restructuring. In turn, the households that are trying to make a living in the resource sectors have had to adjust to a new set of constraints and rigidities, although there are also a few new opportunities. Communities prosper or decline in the process.

Clearly, the top-down model of governance has failed coastal and other rural communities and needs to be replaced with something that can operate across scales and beyond policy, academic, and bureaucratic silos. Piecemeal, highly localized programs are not

an appropriate alternative. Some new land-based and coastal governance structures already exist, and their achievements tell us much about which strategies might help to protect coastal social-ecological health in the future. This is where it is important to insist on the need to recognize constraints at all levels, particularly the institutional constraints that can render local-scale innovations impotent. With that in mind, in our in-depth publications, and also in our overview volume, we discuss some models of collaborative governance that are now actually in operation at the regional or subregional level. In our overview volume we include examples within the realms of watershed management, integrated coastal management, regional economic development, and community-university research and education partnerships. We also discuss the crucial issue of the stewardship of local social-ecological systems by local communities, assessing that concept as a foundation for success in collaborative governance arrangements aimed at long-term resilience of coastal social-ecological systems. Throughout all our work, we are enlightened by our empirical findings, and by questions of social-ecological cross-scale and cross-institution interactions in matters of governance.

Conclusion

Final Reflections

New approaches evolve from historical ones and take place within a context that is multi-scalar in temporal and spatial, among other, dimensions. Acknowledging complexity and focusing on collective ways to understand and better manage complex adaptive systems for social-ecological health help to develop the mindset in which connections between system parts and levels are recognized and cultivated. Collaboration is itself an adaptive response for policy-makers, who over the last several years have had to deal with a range of difficult new circumstances. In this conclusion we examine a range of governance models that hold promise for future ways of managing social-ecological systems, coastal and otherwise: regional economic development structures; coastal zone management; university institutional change; and local social-ecological stewardship initiatives that can be integrated into co-management structures. Most of the initiatives that we have identified as helpful and productive are, sadly, either not linked to or else not well supported by existing formal structures. This is deeply troubling because rural development that is not linked to environmental recovery and stewardship, and that does not support a broad co-management model operating across the nested scales from state to community, is, as we have shown throughout our work, problematic. What has become clear in the course of the extensive and intensive research conducted for the "Coasts Under Stress" project is that it is not enough to address integration only in terms of the spatial and ecosystem dimensions of a coastal zone – its marine, terrestrial, freshwater and estuarine, local, regional, and national aspects. It is also vital that intersectoral, intergovernmental, and interdisciplinary aspects are considered. In other words, both the vertical and horizontal, cross-scale and multi-sectoral dimensions of the coastal

social-ecological system must be considered (Ommer and Team, forthcoming; Sorensen, 1997; Meltzer, 1998). This provides the opportunity for leadership at the local level within a national and even international policy framework that provides co-ordination, funding, and administrative support.

The link between regional economic development, Integrated Management, and resource management has yet to be fully developed or established in these models. Greater attention to environment-economy interrelationships and commitment to the concept of resilience are required. Many local institutions, guided by higher-level policies, have pursued the goal of economic diversification, but "new economy" sectors (such as information technology, tourism, and small business development), while critical to diversification and thus to increased resilience and long-term community survival, must be balanced with traditional sectors that form the foundation of community economies, history, and identity. Development in resource sectors necessarily involves attention to intergenerationally sustainable resource management and land use, and requires an incorporation of the stewardship ethic into regional economic development policy and practice.

Clearly, regional economic development institutions (such as Newfoundland and Labrador's Regional Economic Development Boards and British Columbia's Community Futures Development Corporations) must fit the needs of local community economic development organizations and activities, and governments need to pay attention to linkages between scales, clarifying relationships and increasing communication and co-operation, while recognizing financial and human resource realities. Integrated Management should evolve in this direction through a multi-staged multi-scale process in which time and resources are allocated for building capacity (human, technical, financial, legal/administrative) and for creating the cross-scale and cross-sector relationships that will provide a solid foundation for the future of the process. We should be working towards a more balanced and collaborative approach that creates linkages within the divide of bottom-up endogenous development and top-down government-run economic development programs for "disadvantaged" regions. At the same time, we need to identify and seek to remove still existing "silos" that deny the connectedness of society and ecology in social-ecological systems and that ignore the difficulties of local-level change in the midst of higher-level rigidities.

In this respect, "development institutions," both formal and informal, are important vehicles for governance learning. Such

institutions, with appropriate support and appropriate organizational and institutional frameworks, could facilitate the undertaking of increased responsibilities at the local and regional levels and lead to resilience in local social-ecological systems within the greater meta-system (i.e., "panarchy," Gunderson and Holling, 2002) of the state. There needs to be a cross-scale and cross-sector drive to recovery, which is consciously and structurally combined with the promotion of both human health (employment, income, physical and work environments, gender and social equity – all of the health determinants) and health of the environment. Co-operation between provincial and federal actors and other interests such as the private sector and academia is essential here, as are a supportive legislative and policy framework, strong local institutions, and community action and commitment. Also critical are the informal personal relationships that develop through interactions associated with these institutions. These relationships provide the "glue" that ultimately makes these institutions work, building trust, mutual respect, and understanding over time. At the same time, shorter-term concrete achievements, reflection, and learning should be achieved and celebrated along the way.

Significantly, the multiple versions of new organizational structures that exist in Canada speak to the "panarchy" idea that creative experimentation must take place at the lowest (grassroots) level of a complex system for it to be at a small enough scale to be testable and hence adaptive. That creativity then needs to be discussed across scales and adopted at the upper levels when judged appropriate and useful. It is encouraging that this appears to be feasible inside the Canadian federal and provincial systems. With their local focus, regional development institutions exercise significant local influence. They now need to link up (to scales beyond the region), down (to communities within their region), and out (to other regional efforts) in order to be effective and influence broader changes in society that ultimately affect their own efforts. This can be done by encouraging and supporting the continued development of community stewardship and collaborative governance models across the country, utilizing knowledge gained through critical analysis of existing experiences and sharing of lessons learned. Such an approach must be pursued with awareness that "one size does not fit all," that different regions will require different solutions and that not all communities and regions may wish, or have the capacity, to participate. Policies and programs to support local initiatives must be accompanied by realistic evaluations of resource requirements and availability, and

should involve all actors. As well, they need to provide the mental space or freedom for creative solutions to emerge.

The twenty-first-century notion of collaborative governance can be conceptualized as a broader form of co-management, extending beyond the management of ecological resources to a broad cross-section of societal affairs ranging from fisheries management and land-use planning to education and health care. We therefore suggest, based on local and international experience, that Canada adopt 10 key guidelines for integrated coastal management (Vodden et al., 2003):

1. ensure ecosystem health and integrity;
2. assert community rights and leadership, identifying and working through value differences to reach a mutually satisfactory set of goals based on agreed values and underlying principles;
3. recognize Aboriginal rights and title;
4. create and commit to new ways of working together, including merging stewardship and co-management approaches that enshrine the principles of precautionary management and adjacency;
5. determine the appropriate scales for different parts of the planning and management process;
6. set realistic timelines;
7. practise adaptive management that includes identifying and learning to work with and around real constraints at any level of the process;
8. make capacity-building an integral part of the planning process;
9. integrate local and scientific knowledge, include existing information in the process, and strive to fill critical knowledge gaps;
10. recognize and incorporate multiple values and uses.

"Coasts Under Stress" examined coastal issues using a "spotlight" and "searchlight" approach, which let us survey the broad context in which coastal communities developed and survived ("searchlight"), while also employing in-depth case studies ("spotlight") to get at the vital details that uncovered the linkages, pathways, interdependencies, and connectivities involved in the restructuring that coastal communities and environments have faced. Our research modus operandi is also potentially very useful for policy-makers as they seek ways to think and operate "outside the box" in complex situations. We suggest that identifying various kinds of research as either "spotlight" or "searchlight" work will enable policy-makers to use a wide range of research in appropriate ways. Certainly, significant opportunities exist to create and build

upon new networks and institutional models, such as we have discussed in our overview volume, in this time of continuing coastal governance reform. For this to happen, however, we will need, as a nation, to adopt an attitude of open and ongoing examination of innovations, to be free to implement, and if necessary change to suit place and circumstance, any improvements that may occur. This is an adaptive co-management approach to social-ecological health that reflects a commitment to ongoing social learning. The result will be not only a dramatic increase in social-ecological health and coastal community resilience, but also a new leadership role for Canada in the ongoing global striving for coastal community reform.

References

Auditor General of Canada (AGC). 1997. *Fisheries and Oceans Canada: Sustainable Fisheries Framework: Atlantic Groundfish*, chapter 14. At: <www.oag-bvg.gc.ca>.

Clayoquot Sound Scientific Panel. 1995. *First Nations' Perspectives Relating to Forest Practices Standards in Clayoquot Sound.*

Cruikshank, D. 1991. *A Commission of Inquiry into Licensing and Related Policies of the Department of Fisheries and Oceans: The Fisherman's Report.* Vancouver: United Fishermen and Allied Workers' Union.

Dolan, A.H., S.M. Taylor, B. Neis, J. Eyles, R.E. Ommer, D.C. Schneider, and W.A. Montevecchi. 2005. "Restructuring and health in Canadian coastal communities: A social-ecological framework of restructuring and health," *EcoHealth* 2, 3: 195-208. At: <http://dx.doi.org/10.1007/s10393-005-6333-7>.

Ecotrust Canada. 1997. *Seeing the Ocean through the Trees: A Conservation-based Development Strategy for Clayoquot Sound.* Vancouver: Ecotrust Canada.

Ecotrust Canada and Ecotrust. 2004. *Catch-22: Conservation, Communities and the Privatization of BC Fisheries.* Vancouver: Ecotrust Canada.

Gowgaia Institute. 2003. "Haida Gwaii: What's been logged?" *SpruceRoots Magazine.* At: <www.spruceroots.org/Gallery/Logging.html>.

Gunderson, L., and C.S. Holling. 2002. *Panarchy: Understanding Transformations in Human and Natural Systems.* Washington: Island Press.

Howse, D.G., B. Neis, A. Cartier, L. Horth-Susin, M. Jong, and M. Swanson. Forthcoming. "Gender and snow crab occupational asthma in Newfoundland and Labrador, Canada," *Environmental Research.*

Lutz, J., and B. Neis, eds. Forthcoming. *Making and Moving Knowledge.*

Maxwell, L. 2003. "Teachers Speak: Impact of Restructuring on the Daily Lives of Elementary Educators," MA thesis, University of Victoria.

McDonnell, M.J., T. Steward, A. Pickett, P. Groffman, P. Bohlen, R.V. Pouyat, W.C. Zipperer, R.W. Parmelee, M.M. Carreiro, and K. Medley. 1997. "Ecosystem processes along an urban-to-rural gradient," *Urban Ecosystems* 1: 21-36.

Meltzer, E. 1998. *International Review of Integrated Coastal Zone Management: Potential Application to the East and West Coasts of Canada.* Ottawa: Department of Fisheries and Oceans.

Ommer, R.E., and Team. Forthcoming. *Coasts Under Stress: Restructuring and Social-Ecological Health.* Montreal and Kingston: McGill-Queen's University Press.

Pacific Salmon Revitalization Plan Review Panel. 1996. *Tangled Lines: A Federal-Provincial Review of the Mifflin Plan.*

Palmer, C.T., and P.R. Sinclair. 1997. *When the Fish Are Gone: Ecological Disaster and Fishers in Northwest Newfoundland.* Halifax: Fernwood.

Parrish, C.C., N.J. Turner, and S.M. Solberg, eds. Forthcoming. *Resetting the Kitchen Table: Food Security, Culture, Health and Resilience in Coastal Communities.* Hauppauge, N.Y.: Nova Science.

Praxis Research and Consulting. 2005. *Setting a New Course – Phase II, Human Resources Sector Study for the Fish Harvesting Industry in Canada.* Ottawa: Canadian Council of Professional Fish Harvesters.

Prince Rupert Economic Development Commission. 2002. *A Socio-economic Impact Analysis of Skeena Cellulose Inc.* Prince Rupert, B.C.: Prince Rupert Economic Development Commission.

Rajala, R. 2006. *Up-Coast: Forests, People, and Industry on British Columbia's Central and North Coast, 1870-2004.* Victoria: Royal British Columbia Museum and Coasts Under Stress Research Project.

Sinclair, P.R., and R.E. Ommer, eds. 2006. *Power and Restructuring: Shaping Canada's Coastal Society and Environment.* St. John's: ISER Books.

Sorensen, J. 1997. "National and International Efforts at Integrated Coastal Management: Definitions, Achievements, Lessons," *Coastal Management* 25, 1: 3-41.

Statistics Canada. 2001. *Community Profiles.* At: <www.statcan.ca/english/profil101/>.

Vodden, K. 2002. "Sustainable community development in a coastal context: The case of Alert Bay, British Columbia," *Canadian Journal of Aboriginal Economic Development* 3, 1: 58-75.

———. Forthcoming. "Collaborative Governance and the Search for Sustainability in Canada's Coastal Regions," Ph.D. thesis, Simon Fraser University.

———, J. Penikett, and M. Berry. 2003. *Examining Best Practices in Coastal Zone Planning: Lessons and Applications for BC's Central Coast.* Burnaby, B.C.: Simon Fraser University Centre for Coastal Studies. At: <www.sfu.ca/coastalstudies>.

Whitson, D. 2001. "Nature as playground: Recreation and gentrification in the mountain west," in R. Epp and D. Whitson, eds., *Writing Off the Rural West: Globalization, Governments and the Transformation of Rural*

Communities. Edmonton: University of Alberta Press and Parkland Institute, 141-64.

Woods, Diane, producer. 2005. *Ancient Sea Gardens: Mystery of the Pacific Northwest*. AquaCulture Pictures Inc. Narrated by Lorne Cardinal.

Coasts Under Stress: Policy Reflections

Rosemary E. Ommer

The natural resources of Canada's Atlantic and Pacific coasts – of both the sea and the land – have been exploited for centuries, in many cases to the point of exhaustion. The stress on resources is mirrored in the many coastal communities, Aboriginal and settler alike, whose *genre de vie* has been shaped by the interactivity between culture, economic activity and these resources. This booklet, intended specifically for policy-makers, summarizes some of the research and the conclusions of "Coasts Under Stress," a research project concerned with the impact of social and environmental restructuring on environmental and human health.

The results of the work of "Coasts Under Stress" are to be found in numerous journal articles, two films, two booklets, one book, and four edited collections, showing how the various parts of life in coastal communities fit together and how social, economic, and environmental restructuring has generated the risks, threats, and opportunities coastal communities (human and biophysical) confront. This publication is drawn from the principal team-written volume (Rosemary E. Ommer and the Coasts Under Stress research project team, *Coasts Under Stress: Understanding Restructuring and Social-Ecological Health*, McGill-Queen's University Press, forthcoming 2007), which provides an overview of all project research. In this volume, we look at how environmental and social change on the west and east coasts of Canada have affected community cohesion, social support, health-care delivery, and the availability of natural and educational resources. As well, we consider how coastal communities have sought to develop and survive within a context of restructuring.

Our interdisciplinary research is, we hope, useful for policy-makers who will need to meet the social and economic challenges that confront these important regions of Canada with policy ideas and solutions that will enhance social-ecological health – the capacity of the human-natural world nexus to deal resiliently with change and the stress that it brings.

Cover Design: *Cove Design*
Cover Image: Coasts Under Stress Logo

ISBN: 1-894725-05-0
ISER Books – Faculty of Arts Publications
Memorial University of Newfoundland
St. John's NL A1C 5S7