Assessing the Ability of Forest-based Communities to Respond to Transformative Change:

A Review of Potential Frameworks

Prepared by Lisa Christensen, Fundy Model Forest, for the Canadian Model Forest Network

September 29, 2009

CANADIAN MODEL FOREST NETWORK

RÉSEAU CANADIEN DE FORÊTS MODÈLES

CANADIAN MODEL FOREST NETWORK
RÉSEAU CANADIEN DE FORÊTS MODÈLES

Canadian Model Forest Network
POBag 2150, 10 Campus Drive
Kemptville, Ontario K0G 1J0

President: Dave Winston R.P.F.

Web: www.modelforest.net

Info: cmfn@cmfn-rcfm.ca

Tel: 613.258.8400

CONTENTS

Introduction

The past five years have been challenging ones for Canada's rural economy and the communities it supports. Shifts in the economy relating to high-energy costs, the decline in the United States economy, increased competition, and shifting demand for traditional products have all conspired to create challenges for such communities. Canada's forest-based communities in particular, have had to deal with a rising number of challenges associated with production curtailments and mill layoffs and closures.

In light of such circumstances, many communities will be required to assess their assets, find new opportunities, and re-plan for the future. In part, this will require the deployment of capacities to assess their current status, strengths, and weaknesses. Having indicators tailored specifically for rural communities in today's economic climate is one way of fostering their ability to monitor progress, enact positive change, and support related community-planning initiatives. Indicator monitoring frameworks that reflect communities undergoing transformation, reorganization, and change are particularly relevant.

Frameworks that emphasize such indicators may be found in the emerging field of resilience science, which has been studied across disciplines such as ecology, human geography, psychology, and rural sociology. People use the term resilience to describe abilities to recover from a disturbance, such as those that may be useful in addressing climate change (Adger and Kelly 1999 for e.g.) and resource development (Adger 2000; Varghese et al. 2006). A number of assessment frameworks based on resilience actually draw upon the strong foundations of community sustainability—a concept around which numerous indicator frameworks have been built and refined over the decades. Like resilience, community sustainability holds constructs such as adaptability and community capacity, at its core.

The goal of this discussion paper is to illuminate key contributions and lessons learned in the development of social-indicator frameworks, and in particular how they have been used in community sustainability and resilience assessments. Assessments that focus on related concepts, such as vulnerability and adaptability, are also explored in this review. The impact assessment literature also offers valuable insights into processes related to indicator framework development—such as how best to involve the public when identifying potential project impacts and how to effectively implement follow-up monitoring—and as such, a cursory review of key works is included. It is hoped that this review will support pilot-project participants in their endeavours to build a framework designed to assist rural communities build capacity and meet the opportunities and challenges of a forest sector in transition.

Discussion

Social Indicator Approaches to Community Sustainability

Social indicator approaches to assessing community sustainability have an extensive history. A number of authors (such as Beckley *et al.* 2002, Nadeau *et al.* 1999) have traced their earliest use in forest management back to the 1940s, when sustainability was largely a function of employment and thus the sustained yield of timber resources (*ibid.)*. As these authors well report, sustainability has since grown to encompass more meaningful indicators that represent a wider selection of constructs, such as community capacity, community well-being, and community resilience.

Common Indicator Categories

In more recent decades, these wider ranging dimensions of sustainability have been applied to a variety of indicator initiatives and at a variety of spatial scales. Through efforts designed to synthesize the multitude of approaches taken to social sustainability there is greater clarity on the types of indicators widely used and agreed upon. Unemployment and poverty, for instance were referred to in more than two-thirds of the reports and studies reviewed by Beckley and Burkosky (1999) in their determination of commonly used indicator categories across 22 different sustainability initiatives. Broad indicator categories uncovered in the authors' review include: employment, income, and economic profile indicators; population; education; health; social pathologies; community cohesion; women; race; decision making; natural resource use. Several studies demonstrate the benefits of examining a combination of indicators that fall within these broad domains (den Otter and Beckley 2002; Parkins and Beckley 2001).

Subjective versus Objective Indicators

Availability of human and financial resources often dictates the combination of indicators used in any community sustainability study. Because of the vast difference in resources required to study objectives versus subjective indicators, there is often debate over their utility. Subjectively defined indicators (or qualitative ones) are represented by concepts that gauge human values and perceptions, such as those associated with well-being—which generally require primary data for understanding. Quantitative or objective indicators are typically based on secondary data sets that represent social-structural variables such as income and employment rates.

Benefits of using quantitative data include that information is collected using consistent methods, are available across multiple jurisdictions and timeframes, and are often publicly accessible. Without the complement of qualitative information, however, several scholars (Beckley 2000; den Otter and Beckley 2002; Parkins and Beckley, 2001; Beckley and Burkosky 1999) argue that these measures may fail to capture more nuanced aspects of community life part and parcel to sustainability, such as quality of life and place attachment. Qualitative information may provide important community context in this way as well as shed light upon perspectives key to enhancing community sustainability (Parkins 1999). For instance, in their study of sustainability in the Western Newfoundland Model Forest (WNMF), den Otter and Beckley (2002) found that despite relatively poor performance on quantitative indicators, many residents reported high levels of quality of life—a reason many felt strongly connected to their communities. Thus, without a comprehensive understanding of community dynamics forest managers may run the risk of erroneous management interventions.

Determination of causality has also been noted as a challenge associated with use of quantitative data, especially when aggregated sources are used (Jackson *et al.* 2004; Morford 2007). Furthermore, Kusel (1996) states that objective sociodemographic measures can obscure distributional issues within families, communities or regions as well as the ability of individuals to affect their own quality of life.

Although it can be difficult and costly to develop appropriate measures for subjective concepts and determine their role in ensuring sustainability (Beckley and Burkosky 1999) reporting on them as well as their objective counterparts is now considered key to understanding community sustainability.

Approaches to Indicator Development

Although certain types of indicators are now recognized as highly relevant to the measurement of community sustainability, indicator-selection processes still vary according to the purpose(s) behind them, available time and resources, values and biases of those involved, and the scale of focus, for example. A number of authors have examined the variation in indicator-generation processes and made methodological contributions—these are outlined below.

One of the broadest overviews of local-level indicator frameworks is by von Mirbach (2000). Several important processes are highlighted in this document, including the variety of approaches to indicator selection taken by model-forest communities across the Canada, lessons learned in the process, and information on topics such as: evaluation criteria for indicators; data requirements; challenges in data collection; and how to simplify data collection. von Mirbach also includes a consolidated matrix of local level indicators according to use by model forest.

Hickey and Innes (2005) also developed an indicator matrix, but for British Columbia forests in particular. Criteria and indicators (C&I) from BC and around the world were reviewed with the aim of producing scientifically sound and commonly accepted C&I. Their methodology comprised an analysis of over 70 C&I initiatives using the constant comparative method; feedback on the resultant list was then heard from industry and government representatives. Swift and Dunford's

(2005) report complements this work by defining a decision framework to link C&I information to policy, management, and operational decisions.

C&I framework development efforts have not only been designed for particular regional scales, but also for particular cultural groups. Karjala *et al.* (2004) developed a C&I framework (known as the Aboriginal Forest Planning Process, of AFPP) that integrates aboriginal values and management approaches with forest management science. Their methodology involved aggregation of a variety of community information in order to develop criteria, objectives, and goals and to guide identification of indicators. Both primary and secondary data sources, such as archived community information, informed the framework. One of the unique aspects of their approach is the nonhierarchical format—rather than use existing C&I frameworks, criteria themes represented community-specific values and concerns. In a later study, Sherry *et al.* (2005) compare the AFPP to three well-known C&I frameworks for sustainable forestry to demonstrate the importance of bottom-up approaches. While recognizing that broad-scale frameworks can enhance management of sustainability by providing policy context and structure, authors highlight the additional level of detail and enhanced understanding of complex systems (integration of social, economic, and ecological factors) brought forth by local-level C&I.

Improvements in the area of integration of social, economic, and ecological factors are also made in Natcher and Hickey's (2002) local level C&I approach to community sustainability. Although in this case the primary focus is development of an approach that fosters and monitors pluralistic representation in natural resource management in aboriginal communities.

Although Jeffrey *et al.*'s (2006) study is a departure from the context of forest-based communities, they make an important contribution to community-based approaches to indicator development. Two distinct methodologies for two projects are described in this study and are unique in the way they account for cultural diversity. One project, for example involved a diverse group of people (chiefs and council, health directors, Prince Albert Grand Council, communities, and community-based health practitioners) to problem solve and develop a culturally sensitive suite of indicators.

Another local-level approach to social indicator development undertaken by Parkins *et al.* (2001) identified social indicators of sustainability for three Saskatchewan communities. Residents of the communities participated in workshops, an indicator evaluation framework, and surveys to identify and prioritize indicators for use in sustainability monitoring—and each defined sustainability quite differently. Like Sherry *et al.* (2005) and Karjala *et al.* (2004), findings here indicate that community sustainability is largely defined on a community-specific basis and requires both local-level and broad-scale approaches to indicator development.

Scholarly contributions more conceptual in nature include MacKendrick and Parkin's (2004) project that identifies indicators of community sustainability in rural British Columbia. A synthesis approach is developed here, which comprises theoretical and methodological foundations from 5 selected studies. An important dimension of their approach is the way a sustainable community is defined: one that strives to maintain a healthy and thriving economy, society, and environment, adapts to internal and external stresses, takes advantage of internal and external opportunities, has a high quality of life for residents, and persists through time. The framework itself organizes

indicators into four types of capital: natural, economic, social, and human. Outcome and process indicators are included in the framework, which help provide directional outcomes and contextual information on community dynamics. Authors emphasize the importance of community feedback and the use of evaluative criteria when developing indicator frameworks.

Hodge's (1997) framework for assessing sustainability is based on a comprehensive review of 29 approaches to modeling human-environment systems, in which both frameworks for and insights regarding sustainability reporting are considered. The author identifies four indicator domains that emphasize both the systems and values aspects of sustainability. These domains include ecosystem, interaction (people and ecosystems), people, and synthesis (an integrated perspectives for decision makers); a useful set of "test questions" designed to address equity of the reporting system are also included. Indicator development processes are not covered in this paper.

Resilience

In everyday use, people use the term resilience to describe the ability to recover from stress or change. When used to describe the dynamics of linked social-ecological systems, resilience is characterized by one with the capacity to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (Walker *et al.* 2002). Transformation and reorganization are emphasized with this interpretation, which is highly relevant to forest-based communities in Canada seeking to reorganize in response to the range of challenges they currently face.

The scientific study of resilience began with a focus on ecosystems (Holling 1973) and how to manage them, but now encompasses a variety of social processes that contribute to resilience, including "social learning and social memory, mental models and knowledge-system integration, visioning and scenario building, leadership, agents, and actor groups, social networks, institutional and organizational inertia and change, adaptive capacity, transformability and systems of adaptive governance that allow for management of essential ecosystem services" (Folke 2006: 263). Studies that seek better understanding of social processes related to climate change (Adger 2000), resource dependency (Marshall *et al.* 2007), and ownership of resources (Varghese *et al.* 2006) are testament to this broadened view of resilience. The concept of resilience has also been applied to social-indicator frameworks, which have been employed at a variety of spatial scales using quite a variety of methods.

Framework Approaches to Measuring Resilience

One of the first large-scale studies of resilient forest-based communities was conducted by Harris *et al.* (1998). Two main questions framed this research: how well prepared are communities for change? What characteristics contribute to this ability? To answer these questions, focus groups were held—in which participants discussed results of a community-assessment workbook were completed beforehand—and secondary data on population, income, and employment analyzed. Based on identified perceptions on community conditions and characteristics, a community

resilience index was developed and used to compare perceived and actual levels of resilience as well as resilience across community types. Authors discuss implications of this research in terms of key factors that contribute to resiliency and how land management and community development policies may draw from such information.

Maguire and Cartwright (2008) also developed a resilience approach to social assessment, which is largely conceptual and aimed at helping communities and governments identify resources and adaptive capacities to address change. To clarify theoretical foundations of this approach, relationships between vulnerability, adaptive capacity, and resilience are discussed at length. Suggested indicator domains for a resilience-based assessment are based on: definition of the issue; the internal community structure; community history; community vulnerabilities; community resources; and adaptive capacities. Authors say the strength in this approach lies in its ability to build on existing community capacities rather than identified weaknesses or vulnerabilities, which they argue is a downfall of traditional approaches to social assessment (and social impact assessment). Assessment continuity comes highly recommended, because of the persistent nature of change that necessitates ongoing response and action.

In 2008, the University of Queensland and the University of Southern Queensland developed a "toolkit" for building resilience in rural communities. In collaboration with the Stanthorpe community, contributing authors developed a list of 11 psychological factors that enhance resilience at the individual, group, and community levels: social networks and support; positive outlook; learning; early experiences; environment and lifestyle; infrastructure and support services; sense of purpose; diverse and innovative economy; embracing differences; beliefs; and leadership. These factors were developed through a variety of resident interviews regarding perceptions of and contributing factors to resilience; further consultations occurred via workshops, which resulted in organization of the final toolkit.

Another resilience model developed specifically for use by communities is known as "the transition initiative," found in *The Transition Handbook* (Hopkins 2008). This popular handbook is largely a how-to manual for communities interested in reducing oil dependency by developing more localized economies so they can endure the changes associated with depletion of world oil and gas resources. More than 35 of these initiatives are now underway in the UK and more than 500 globally, some of which are reported on by the authors in terms of their progress made to-date.

Yet another model, *The Communities Resilience Manual*, is the result of a partnership between the Communities Committee of Forest Renewal BC and the Centre for Community Enterprise. These two partners came together to provide rural BC communities with a resource designed to assess local circumstances effectively and guide the investment of limited resources. This resource has two components: one that helps communities understand the resilience process and decide whether or not to use it; and one that guides the process itself. A resilient community is understood as one that influences the capacity of individuals and institutions to respond to and influence social and economic change. A number of BC community test sites helped the team evaluate progress on this handbook and manual. Feedback on this process may be particularly relevant to the CMFN's pilot project.

Vulnerability and Adaptability Assessments

Vulnerability is a concept that denotes the ability of individuals, groups, or communities to cope with and adapt to stress (adaptability is implied). Its relation to resilience, briefly, is that when the resilience of a system is lowered, its vulnerability to stresses affecting the system increases. Vulnerability has roots in literature relating to disaster, famine, drought, and climate change. To understand social vulnerability to climate change for example, Adger and Kelly (1999) discuss the availability of resources and entitlement to those resources as factors that can influence individual or collective means for coping with change. They assert that poverty, inequality, and institutional adaptation can all affect vulnerability and thus the potential for adaptation.

Donoghue and Haynes (2002) developed a viability/adaptability framework and applied it to fifty-four communities in Oregon. The objective here was to identify communities with low adaptability to changing socioeconomic conditions so that the local forest sector could adjust their mitigative strategies and management efforts accordingly. Proxy measures for communities with low adaptability included the following: connectivity to service centers; socio-economic well-being; and proximity to public lands. These measures were identified as proxies for vulnerability, in part, because of data available at the county scale. Although measures are well defined, their individual and collective conceptual linkages to viability and vulnerability are poor.

Perhaps more relevant to the CMFN pilot project, because of the spatial scale of focus is Parkins and MacKendrick's (2007) study on the social dimensions of community vulnerability to the Mountain Pine Beetle in rural British Columbia. The authors examine vulnerability at the community level and produce integrated assessments of their biophysical, social, and economic capacities and vulnerabilities so as to foster local adaptive responses. The assessment framework was based on indicators derived from both the climate science and forest sociology literature and focus groups; individual risk perception and adaptive capacity were key topics of discussion. Data were then collected via a combination of secondary sources and a primary data survey. A final index value of vulnerability was developed, which authors describe as a significant limitation of the study due to the complexity the notion of vulnerability itself. Recognizing this limitation, authors disaggregate the final scores according to each identified dimension of vulnerability so that the elements influencing vulnerability are made clear.

Another study that utilizes an index approach to understanding vulnerability and adaptability is that by Daniels (2004). Here, an indicator identified during the Montreal Process, “viability and adaptability to changing economic conditions of forest dependent communities” is taken as the foundation of the study. This indicator is assessed using a socioeconomic resilience index—comprised of lifestyle, economic, and population indices—combined with level of forest dependency (represented by forest land in each county). This combined rating is then used to identify a list of “counties of concern” that may require mitigative policy measures or some from of development assistance. Although helpful for understanding integrated vulnerability assessment, methodologies here are vague, particularly in terms of their conceptual linkages—which when strongly linked with indicators and their associated domains seem to result in effective assessment frameworks, as shown in this review.

Sustainability, Environmental, and Social Impact Assessment

Like the modes of assessment discussed so far, sustainability, environmental, and social impact assessments represent processes designed to enhance sustainable development. Unlike the former, these assessments are legislated in Canada (environmental impact assessment and social impact assessment in some cases) and typically involve the identification of potential impacts that may result from a project, identification of mitigative strategies to address negative impacts, and implementation of follow-up monitoring regimes. And to a greater or lesser degree, the public are involved in these processes—a commonality between impact assessments and other sustainability assessments that employ social-indicator frameworks. That is, both must consider the experiences and knowledge of local people in order to be relevant and to facilitate community sustainability. Another commonality is that the results of monitoring or data gathering are required to test the success of the overall process. Challenges, opportunities, and methodological advances in the field of sustainability, social, and environmental impact assessment are thus shared.

In terms of sustainability assessments, which are generically known as tools to advance sustainable development, Pope *et al.* (2004) review existing approaches and propose a conceptual model as a starting point for an alternative. Environmental impact assessment (EIA) and strategic environmental assessment (SEA) are reviewed. The contributions they make to the field are reviewed and limitations discussed—one of the most notable of which being the tendency for trade-offs to occur with respect to social, economic, and environmental considerations. In their proposed approach, a clear concept of sustainability as a goal is recommended so that initiatives can be separated according to whether they are sustainable rather than assessed according to a certain "direction to target," as is often the case in EIA and SEA.

In 2005, Hunsberger *et al.* analyzed a set of case studies to determine possibilities for enhancing citizen involvement in environmental assessment and follow-up monitoring. Ways to foster citizen involvement range from those to enhance volunteer efforts to collect reliable information, to alternative monitoring efforts that use multimedia products such as photos and video footage, and compilation of community monitoring data into searchable databases. Challenges associated with funding for long-term monitoring programs are also addressed in this paper. Creative funding models such as inclusion of local tax base sources, voluntary contributions, project proponents, and user-pay models are put forward.

Ross (1990) developed community social impact assessment for indigenous peoples based on her work with a group of communities in Western Australia. This is an important contribution to the field, because of its focus on community control, exercised through the following elements: community values and perspectives; SIA in a social and cultural context; research methods that represent Aboriginal viewpoints; and an extension of the cumulative view to include aspirations for the future. In this case, oral history was the research method selected by the community—a method not considered by the researcher at the outset of the research, which allowed participants to express their knowledge and views in ways preferable to them. Stories were also recorded for the benefit of the community, school, and future generations.

Along a similar vein, O'Faircheallaigh (1999, 2007) identifies many of the barriers to effective EIA follow-up and participation for indigenous communities in both Australia and Canada; inadequate EIA follow-up has been noted by several Canadian researchers (Baxter *et al.* 2001, Duinker and Greig 2006). He advocates that a

negotiation-based approach to SIA has potential to address both issues so that SIA findings have greater influence on the development and operation of projects. Including the development of specific structures and processes that foster participation and follow-up in negotiations are considered especially important; securing financial resources for ongoing monitoring efforts, obtaining commitment by key players to such monitoring, and applying traditional ecological knowledge to the assessment are some examples. O'Faircheallaigh also recognizes the power contextual factors can have over the outcome of a negotiations-based approach, such as that exploitation of an existing imbalance of power balance may occur vis-à-vis the process.

Conclusion

Social indicator frameworks have a long tradition in assessments of community sustainability, as shown in this review. They have also been more recently applied to a number of other related constructs, such as resilience, vulnerability, and adaptability. Application of these frameworks in a variety of social, political, and cultural contexts as well as lessons learned in the field of impact and sustainability assessment illuminate key considerations for the CMFN indicator project on communities undergoing transformative change. In a summarized form these include the following:

- Using subjective and objective indicator combinations as well as framework approaches that balance the local with broad level are important in developing a comprehensive picture of community dynamics. Local level indicators in particular, may be more effective at elucidating an integrated view of society, environment, and economy than broad level, which is especially pertinent to aboriginal communities that espouse holistic worldviews.

- Involving a community in development of the indicator approach and the indicator selection process itself is key. Methodologies that account for cultural and social diversity, spatial scale, existing community resources, and desired community resources (such as records of oral histories) are all important considerations.

- Indicator frameworks with strong conceptual underpinnings can likely offer communities results that represent more than just a "starting point" when it comes to management actions. In practice, this would involve clearly defined methodological foundations (a concept or series of concepts) combined with identification of relevant indicator domains; the convergence of community sustainability, resilience, vulnerability, and adaptive capacity has much to offer in this way.

- Assessment continuity is an important aspect of a framework's success and positive reception by communities over time: having adequate financial resources in place is part of making this a reality; involvement of local people in the assessment work itself is another, which may also be key to translating results of the assessment into management practice.

Annotated Bibliography

Social Indicator Approaches to Assessing Community Sustainability

Beckley, T.M. 2000. Sustainability for Whom? Social Indicators for Forest-dependent Communities in Canada. Project Report 2000-34. Sustainable Forest Management Network.

Abstract. Increasingly, humans are recognized as integral components of forest systems. Certainly, humans are one of the dominant sources of disturbance in forested ecosystems. This research examines the sustainability of human forest communities. A great deal of human interaction with forests has the end purpose of deriving a livelihood. This is true of human communities that rely on subsistence use of the forest, human communities that use their forests to create fiber-based products, and human communities that rely on expenditures by visitors to their local forests. This research examines all three of these community types, as well as communities that rely on a diversified mix of these activities for their economic base. A combination of methodological tools is used in this study to elucidate what sustainability means in nine case study communities. We report quantitative data on a standard suite of community well-being indicators, but we also report qualitative data from over 450 face-to-face interviews with residents of our case study sites. This combined methodological approach represents a significant advance over static, quantitative models or strictly narrative approaches. We structure our narrative data collection around sustainability indicators that the research team chose. We recognize that it is also important to obtain local residents subjective perceptions of social and economic trends. Our face-to-face interviews are sufficiently open-ended that important local themes unrelated to our chosen indicators also emerged. Community sustainability is a flexible concept and one that involves a significant degree of subjective interpretation. We therefore chose not to place our nine case study communities in discrete, dichotomous categories of "sustainable" and "not sustainable." Rather, we report on structural conditions that enhance sustainability (high human capital, rich natural resource endowments, etc.) and we also report on factors that create challenges to community sustainability (high poverty rates, high unemployment, high population turnover, etc.). For each case study we describe three such community sustainability assets" and three "liabilities".

Beckley, T.M., and T.M. Burkosky. 1999. Social Indicator Approaches to Assessing and Monitoring Forest Community Sustainability. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-360.

Abstract. Several national and international initiatives have encouraged the development of criteria and indicators to measure progress in sustainable development and sustainable forest management. This review is intended to introduce the forestry community to social indicators that have been used to document and monitor community sustainability and community well-being. Natural resource sociologists have been studying community stability for over half a century. Included is a discussion regarding selection criteria for social indicators that focuses on the advantages and disadvantages of qualitative and quantitative indicators. A review of several ongoing projects is included, and the appendix provides a quick reference for twenty-two indicator initiatives.

Beckley, T., J. Parkins, and R. Stedman. 2002. Indicators of forest-dependent community sustainability: The evolution of research. *The Forestry Chronicle* 78(5): 626-636.

Abstract. This paper describes the evolution of research on socio-economic indicators of community sustainability in several Canadian Model Forest locations since 1994. In the Foothills and Western Newfoundland Model Forests, we employed an "expert-driven" approach to indicator selection and reporting. We used census data to document change over time on key community profile variables such as age, employment, income, population mobility, education attainment, poverty, and real estate values. Objective measures of these variables were supplemented with personal interviews in order to construct a more dynamic picture of community well-being. The early work of our group focused primarily on "profile" indicators—essentially static, descriptive indicators that allow one to create a snapshot of a community in time. Work is currently underway on the next generation of socio-economic indicators we describe as "process" indicators. Process indicators deal more with causal affects than outcomes. They include things like sense of place or attachment to place (which has implications for population mobility and education attainment). Process indicators also include variables such as leadership, volunteerism, entrepreneurship, and social cohesion—all of which we are attempting to include in a combined measure of community capacity.

Brugmann, J. 1997. Is there a method in our measurement? The use of indicators in local sustainable development planning. *Local Environment* 2(1): 59-72.

Abstract. Sustainability indicators are being used in local communities to serve multiple and sometimes vague or contradictory objectives. This can add to confusion about sustainable development among the public and policy makers. The case of Seattle, USA is used to illustrate how a set of well-developed indicators can fail to meet their objectives if they are unrelated to a methodical planning process. The cases of the State of Oregon, USA and Santa Monica, USA are then presented to demonstrate how indicators can be used effectively in sustainable development planning to measure performance and to promote positive change. The author concludes that, at the local level, indicators are ideally suited for performance measurement. Indicators are a sub-optimal tool for technical assessment and even public education. Applications of indicators for these two purposes can compromise the performance measurement function.

den Otter, M.A. and T.M. Beckley. 2002. 'This is paradise': Monitoring community sustainability in the western Newfoundland Model Forest using subjective and objective approaches. Nat. Resour. Can., Can. For. Serv., Atl. For. Centre., Fredericton, New Brunswick. Inf. Rep. M-X-216E.

Abstract. This report monitors community sustainability in the Western Newfoundland Model Forest. Specific focus is placed on the communities of Corner Brook, Pasadena, Lark Harbour, and Rocky Harbour as these are representative of the region's community types. Two different social indicator approaches are used: objective measures in the form of Canadian census data, and subjective measures from personal interviews with community residents. The objective measures suggest that socio-economic conditions are difficult in western Newfoundland in comparison with the rest of the nation. Rates of unemployment are high, incomes are low, and many families live below the poverty line. The subjective assessment presents a contrasting picture to the objective indicators. Many people are committed to the region and seek ways to supplement incomes and make a living from a variety of sources. Although there has been some population loss in outlying communities in recent decades, many are apparently willing to trade off income and income-earning potential for other aspects of quality of life they feel are unique to the region. Newfoundlanders in this study area appear strongly attached to place and this attachment will factor significantly in the future sustainability of the region and the communities that comprise it.

Hart, M. 1999. *Guide to Sustainable Community Indicators*. Montreal: QLF Canada.

Summary. This practical guide to creating and using indicators is centred around a notion of community sustainability with quality of life at its core. Hart describes sustainability indicators by emphasizing connections among the environment, economy, and society; many examples of these integrated indicators are provided. Taking a long range view of the community is encouraged as well as early actions on indicators that reflect negative trends. Evaluative criteria are included in this guide, as well as many examples of effective indicators, potential data sources, and links to organizations engaged in sustainability indicator monitoring efforts.

Hickey, G.M. and J.L. Innes. 2005. Scientific Review and Gap Analysis of Sustainable Forest Management Criteria and Indicators Initiatives. FORREX Series 17.

Abstract. In April 2004, the Province of British Columbia, through the Forest Practices Board, engaged FORREX Forest Research Extension Partnership to collaborate with interested key parties and identify the work needed to complete sets of criteria and indicators (C&I) for British Columbia's forests. The following report is the first in a series of three that summarize the results of the 2004 foundation projects. It focuses on determining common scientifically sound, useful, and effective criteria and indicators and monitoring systems for British Columbia's forests (Area One). As part of the foundation project, "Science Review and Gap Analysis," a matrix of 3000 scientifically reviewed indicators related to British Columbia-relevant SFM criteria was created. This indicator matrix was then analyzed and systematically reduced by researchers in the Sustainable Forest Management Laboratory at the University of British Columbia (UBC). Feedback from government and industry representatives on the resulting list of indicators was heard at the C&I Forum held in Vancouver, British Columbia on February 18-19, 2005.

Hodge, T. 1997. Toward a conceptual framework for assessing progress toward sustainability. *Social Indicators Research* 40(1-2): 5-98.

Abstract. Through the past half-century, much effort in a variety of disciplines, has been put to developing an approach to assessing change that pushes beyond an emphasis on economic signals to include a more complete treatment of human and ecosystem well-being. This challenge lies at the very heart of reporting on progress toward sustainability. Key to addressing this challenge is developing an effective conceptualization of the human-ecosystem relationship. The results of a review of 29 conceptual models that address the human-ecosystem relationship are presented. These results are used to develop a conceptual approach to assessing progress toward sustainability that: (1) builds on a number of common features drawn from these models; (2) is founded on a value set that insists on parallel care and respect for people and the ecosystem together; and (3) is consistent with systems ideas.

Jackson, J.E., R.G. Lee, and P. Sommers. 2004. Monitoring the community impacts of the Northwest Forest Plan: An alternative to social indicators. *Society and Natural Resources* 17: 223-233.

Abstract. Use of existing data sources has made the social indicators approach an attractive method for anticipating the social and economic effects of policy changes on resource-dependent communities. Despite its practicality, this approach is severely limited by data availability and reliance on aggregate figures that obscure variation between smaller areas. A forest-dependent community in Washington State was studied in an attempt to discern the effects of the Northwest Forest Plan on local-level social and economic conditions using data from secondary sources supplemented by targeted interviews. Findings from this pilot study strongly suggest that a social indicators approach cannot determine the causal factors behind social and economic change in rural communities. We propose a strategy for repeated surveys of communities and recommend an investment in longitudinal analysis of community businesses, households, and individuals in locales thought likely to be affected by changes in federal land management policies.

Jeffrey, B., S. Abonyi, R. Labonte, and K. Duncan. 2006. Engaging numbers: Developing health indicators that matter for First Nations and Inuit People. *Journal of Aboriginal Health*: 44-52.

Abstract. This paper addresses citizen participation in the development of community-level health and capacity indicators with a specific focus on processes that can be used to engage community members in indicator development. It is based on work that the authors completed with the Inuit Tapiriit Kanatami (ITK) in 2002 and work they have been conducting in partnership with the Prince Albert Grand Council (PAGC) and Athabasca Health Authority (AHA) in northern Saskatchewan. The latter project developed tools for First Nations health organizations to assess the impacts of their health and social service programs on community wellness and capacity. The project included a critical review of existing community-level population health indicators and indicator frameworks, the identification of gaps in the literature related to culturally appropriate community health indicators, and the utilization of a process by which these indicators might be implemented and tracked by First Nations health organizations at the community level. In addition to the results of our work to date, we highlight some of the literature that specifically addresses Aboriginal conceptions of community health and community capacity along with an assessment of gaps in the literature in the context of culturally appropriate indicators. We conclude

by discussing the processes that we have used with Inuit health groups and community-based First Nations health organizations in identifying culturally appropriate and relevant community health and capacity indicators.

Karjala, M.K., E.E. Sherry, and S.M. Dewhurst. 2004. Criteria and indicators for sustainable forest planning: A framework for recording Aboriginal resource and social values. *Forest Policy and Economics* 6: 95-110.

Abstract. The Aboriginal Forest Planning Process (AFPP) was developed to integrate indigenous and western forest management approaches. The AFPP is a participatory decision-making tool designed to enhance co-management of the John Prince Research Forest (JPRF) in central interior British Columbia, Canada and to elicit goals, objectives, criteria, and indicators of sustainable forest management from the JPRFs Aboriginal partners. Analysis of community interview transcripts, traditional land use documentation, and secondary sources resulted in a three-stage approach to information elicitation, management, and application. Resource and social values, concerns, and traditional knowledge are summarized and compiled according to criteria themes and sub-themes. This condensed information is further divided into spatial, quantitative, and qualitative criteria and indicator categories. The AFPP was a useful method for developing forest management goals, objectives and criteria; however, further interviews were required to identify appropriate management indicators.

Kusel, J. 1996. Well-being in forest-dependent communities. Part I: A new approach. In *Sierra Nevada Ecosystem Project: Final Report to Congress*, Vol II, Assessments and Scientific Basis for Management Options, 361-373. Cent. Water Wildlife Resour., University of California: Davis, California.

***Abstract Not Found.**

MacKendrick, N. A. and J.R. Parkins. 2004. Frameworks for Assessing Community Sustainability: A Synthesis of Current Research in British Columbia. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, AB. Inf. Rep. NOR-X-392.

Abstract. This report describes five recent research projects identifying indicators of community sustainability in rural British Columbia. A sustainable community, as understood by this body of research, is one that strives to maintain a healthy and thriving economy, society, and environment; adapts and responds to external and internal stresses and opportunities; provides a high quality of life for residents; and persists through time. A synthesis approach is developed that combines elements from all five projects into an overarching framework for indicators research. More specifically, the framework organizes indicators derived from the projects into four basic types of capital: natural, economic, social, and human. It also identifies five specific outcomes: ecological integrity, economic vitality, civic vitality, physical and mental health, and recreational opportunities. This framework may serve as a useful organizing tool for indicators research in rural communities within British Columbia and beyond.

Morford, S. 2007. A Review of Social Indicators for Land Use Planning in British Columbia.

Executive Summary. This paper reviews recent land use plan Socio-Economic and Environmental Assessments (SEEAs) to assess the indicators used for measuring social change and discuss their use in light of the emerging research on social indicators. While social indicator research has a long history in many fields, it is relatively new to natural resource and land use planning in North America. There is a growing body of literature on social indicators that gives planners confidence in going beyond employment and population statistics as sole social indicators. By and large, the SEEAs and related documents conducted in support of land use planning lack theoretical frameworks for the selection of indicators; however, there are opportunities to improve the linkages between the selection of social indicators and social science research. Social indicators are used primarily to measure social changes over time in a plan area, regardless of the effects of land use planning. They are also used during plan implementation to monitor changes in social conditions that can be attributed to land use planning. The ability to attribute social changes to land use planning is problematic as many factors influence social conditions. This limits planners to using indicators that are directly affected by land use planning, such as outdoor recreation infrastructure, economic indicators, and First Nations access to cultural resources. Where the purpose of indicators is to understand social change in plan area, the range of indicators and indicator frameworks can be broadened to

include those focused on social process (such as social capital) as well as profile indicators, such as unemployment and population rates. While social process indicators require primary data collection, tools such as Participatory Rural Appraisal and Rapid Rural Appraisal can be adapted to keep data collection costs to a minimum. A literature review of several frameworks assisted in developing a logic model for social indicators in support of land use planning. For this discussion, a community capacity indicator framework synthesized by MacKendrick and Parkins (2004a) is likely the best fit for assessment and implementation of land use planning in British Columbia. Methods to select social indicators can be "top down" (expert-driven) or "bottom up" (locally driven). The literature recommends a combination of the two approaches be used to take advantage of the best available science while addressing specific context and priorities of communities within a plan area. The literature discusses several case studies of the "top-down-meets-bottom up" approach to indicator selection. The ability of communities and individuals to cope with change, to adapt, to take advantage of new opportunities, and to thrive under new circumstances has become a principle interest. Thus contemporary research is focused on concepts of community capacity, resilience, and vulnerability as indicators of the adaptive capacities of human communities. Indicator frameworks found in the literature do not prescribe a set of indicators but offer a menu of indicators framed around research-based categories of indicators. Statistics Canada and BC stats continue to offer the best sources of profile indicator data because of their ability to compare statistics over time and across regions. There are numerous sources of composite social indicators (indices) in the literature but the methodology and assumptions for these indicators should be carefully examined before applying them.

Nadeau, S., B. Shindler, and C. Kakoyannis. 1999. Forest communities: New frameworks for assessing sustainability. *The Forestry Chronicle* 75(5): 747-754.

Abstract. In both Canada and the United States, there has been a growing interest in the sustainability of forests and forest communities. Policy makers and scientists have attempted to understand how forest management practices can enhance or harm the future of such communities. Although many studies have historically used economic indicators as measures of community stability, more recently researchers have demonstrated that the relationship between communities and forests goes far beyond simple economic dependency. Thus, recent frameworks for assessing forest communities have also addressed the need for broader social and institutional components. In this article, we briefly review three of these recent concepts - community capacity, community well-being, and community resiliency -and examine what each of these terms has to contribute to the assessment of forest communities.

Natcher, D. and C. Hickey. 2002. Putting the community back into community-based resource management: A criteria and indicators approach to sustainability. *Human Organization* 61(4): 350-363.

Abstract. Advocates of community-based resource management often depict indigenous communities as homogeneous sites of social consensus. While proving successful at advancing local involvement in the management and decision-making process, these idealized images fail to represent the plurality of values and personal interests nested within indigenous communities. By failing to account for internal diversity, indigenous communities that are now regaining management responsibility for their traditional homelands risk furthering the traditional "top-downism" long inherent in institutionalized resource management. However, in regaining these responsibilities, indigenous communities have an opportunity to implement new and locally defined approaches to management. This paper describes one such community-based process and builds upon the experiences of the Little Red River Cree Nation of Alberta, Canada, to illustrate the challenges and opportunities involved. Specifically, through the use of criteria and performance indicators, derived from multiple community perspectives, the Little Red River Cree Nation has developed a self-improving forest management system that is proving responsive to the values, expectations, and changing needs of community members.

North Central Regional Centre for Rural Development. 1999. Measuring community success and sustainability: an interactive workbook.

Preface. *Measuring Community Success and Sustainability: An Interactive Workbook* describes a process to help communities learn how to measure the local or regional impacts of economic and community development processes that enhance rural community sustainability. The principal purpose is to help communities learn how to measure the concrete results of rural community development and conservation efforts. The entire process is anchored in research that determined the ways in which communities define success in their local development efforts. The measures that came from those communities were analyzed in terms of existing research on community and ecosystem sustainability. The workbook

provides guidance to communities, nonprofit organizations and agency personnel who want to get a better idea of the possible ways to gather information that details progress toward community-established outcomes. Rural communities use these outcomes to develop practical ways to measure progress toward both them and locally established goals in terms of outputs, activities and inputs. Communities can relate their projects to the various outcomes and pick a single measure of that outcome from the menu or design their own measure. To date, a number of communities and multicommunity groups, such as Resource Conservation and Development Councils, have found the menus serve a basis to create their own measures to gather over time. Nonprofit organizations and agencies can then aggregate the data from each community by outcomes to report multi-area impacts over time. The principal purpose, however, remains to provide a way for local communities to measure progress toward local goals. A vital community has the capacity to use, sustain and renew the resources and skills it needs to thrive over time—and to become the kind of community its residents want it to become. Measurement gives feedback to make communities more effective.

Parkins, J.R. 1999. Enhancing social indicators research in a forest-dependent community. *Forestry Chronicle* 75(5): 771-780.

Abstract. Forest industry host communities are receiving increased attention from policy makers, academics, and municipal leaders. Recently, this attention is trained on measuring social and economic change at the community level and on identifying and developing avenues to greater community well-being. This paper examines aspects of two common social indicators, employment and migration, in the context of a forest-dependent community in Northern Alberta. By using statistical information along with two other major data sources that include interviews with local residents and a variety of reports from local institutions, specific social changes taking place within the community are described. Readers are cautioned against relying solely on statistical information to measure change and are encouraged to triangulate data with local sources. Such efforts may be more time consuming but the results are likely to provide more important insights into how and why certain communities are prospering while others are struggling. The paper concludes with a discussion of social capital as a crucial dimension of community well-being.

Parkins, J.R. and T. Beckley. 2001. Monitoring Sustainability in the Foothills Model Forest: a Social Indicators Approach. Nat. Resour. Can., Can. For. Serv., Atlantic For. Cent., Fredericton, New Brunswick. Inf. Rep. M-X-211E

Summary. Relationships between human well-being and natural resource management in the Foothills Model Forest are explored using a social-indicator research framework. In order to understand these relationships, six indicators of sustainability were selected: population and migration, income distribution, human capital, poverty, employment, and real estate. Demographic data from Statistics Canada census profiles and interviews with residents of the model forest were used to report on indicators. Challenges and limitations inherent in measuring community sustainability in this way are discussed.

Parkins, J.R., J. Varghese, and R. Stedman. 2001. Locally Defined Indicators of Community Sustainability in the Prince Albert Model Forest. Nat. Resour. Can., Can. For. Serv., North For. Cent., Edmonton, Alberta and Prince Albert Model Forest, Prince Albert, Saskatchewan. Inf. Rep. NOR-X-379.

Abstract. Forest-based communities can be characterized in terms of their dependence on subsistence practices, park-based tourism, or traditional logging practices. In monitoring the sustainability of these communities, researchers have struggled to develop relevant indicators responsive to their unique social, economic, and environmental conditions. In this study we describe a method used to identify appropriate indicators of sustainability in three north-central Saskatchewan forest-based communities. To address the uniqueness of each locale, we employed a quality-of-life research framework to identify appropriate social indicators and then subjected these indicators to an evaluation framework. The latter framework provided criteria for ranking the indicators according to their general effectiveness and their relevance to important dimensions of sustainability. The findings emphasize the need for caution in asserting the utility of "one-size-fits-all" approaches to community sustainability. These communities defined progress toward sustainability, in terms of quality-of-life indicators, quite differently and therefore each requires a unique set of indicators to measure progress.

—. 2004. Identifying indicators of community sustainability in the Robson Valley, British Columbia. *BC Journal of Ecosystems and Management* 4(2): online.

Abstract. This paper outlines a method of developing indicators of well-being in small, forest-based communities. It also describes some specific measures of well-being in a particular forest-based community in the Robson Valley Forest District, British Columbia. In this project, we attempted to strike a balance between relying on locally obtained information—collected through workshops, interviews, and a mail survey—and information obtained from the social science literature. We took a broad-based approach toward indicator development by identifying goals and indicators pertaining to the entire region. Our paper explores this theoretical orientation in some detail and then provides an account of the dialogical methods used to identify community-based indicators. Of the six community goals we identified, we discuss "maintaining community capacity" at length by examining the empirical data from five indicators and then drawing some conclusions about the status of community capacity in the Robson Valley.

Sherry, E., R. Halseth, G. Fondahl, M. Karjala, and B. Leon. 2005. Local-level criteria and indicators: an Aboriginal perspective on sustainable forest management. *Forestry* 78(5): 513-539.

Summary. As tools for improving the sustainability of forest management, criteria and indicator (C&I) frameworks have grown in popularity over the last decade. Such frameworks have been largely derived from top-down approaches to determining critical measures of forest management success. While useful, they fail to capture many C&I of critical importance to local populations, who experience forest management strategies first hand and who have their own definitions of sustainability. Using archival materials, our research begins to identify one First Nation's forest values and compares these local-level C&I with three well-known C&I frameworks for sustainable forestry. We demonstrate that local-level definitions can provide additional C&I, as well as additional levels of detail to C&I that they share with the national and international frameworks. Both are crucial to developing strategies for sustainable management that meet local as well as broader needs and desires.

Swift, K. and J. Dunford. 2005. Decision Frameworks for Sustainable Forest Management Criteria and Indicators Initiatives. FORREX Series 18.

Abstract. In April 2004, the Province of British Columbia, through the Forest Practices Board, engaged FORREX Forest Research Extension Partnership to collaborate with interested key parties and identify the work needed to complete sets of criteria and indicators (C&I) for British Columbia's forests. The following report is the third in a series of three that summarize the results of the 2004 foundation projects. It defines a decision framework to link criteria and indicators information to policy, management, and operational decisions (Area Three). This report presents the results of interviews with key representatives from both the forest industry and provincial agencies, and offers some interpretation of the data. Generally:

- Two decision frameworks exist within the context of managing the British Columbia landbase: one framework to meet certification requirements and another to meet the legal/legislative requirements.
- These two decision frameworks are functioning independently of one another although mechanisms do exist which could be used to link them together.
- Data and information management are key issues that need to be addressed in both the short and long term.

The report concludes with a summary of the breakout sessions held to address this topic area at the "Common Ground for Criteria and Indicators of Sustainable Forests for British Columbia" forum that took place on February 18–19, 2005.

von Mirbach, M. 2000. A User's Guide to Local Level Indicators of Sustainable Forest Management: Experiences from the Canadian Model Forest Network. Canada's Model Forest Program, Natural Resources Canada, Canadian Forest Service (Ottawa).

Summary. This document was written with the intent to list and describe indicator frameworks that the Canadian Model Forest Network developed up until and including the year 2000. The document covers "processes, protocols and methodologies developed for the identification, development, monitoring, reporting, use and application of local level indicators." The author describes this work as a "how-to" manual on local level indicators. Insights and lessons learned by

model forests across the country as well as information on: ways to evaluate indicator quality; assessing data requirements; simplifying data collection; and addressing data-collection challenges are also included.

von Mirbach, M. 2002. Model Forests and Local Level Indicators: Facing Common Challenges. International Model Forest Network, News and Events. Accessed July 29, 2009 at: http://www.imfn.net/?q=node/655.

Executive Summary. The development of meaningful criteria and indicators (C&I) of sustainable forest management practices can often be a challenge given the diversity of interests involved in model forests and the variety of potential uses for C & I. Based on his experience working with a wide range of model forests, the author addresses some of the common challenges that arise at various stages in the development of local level indicators: how to get started; selecting indicators; maintaining momentum; and finding the right approach. The article also discusses some of the common uses of C&I (i.e. management planning, accountability, best management practices, and raising public awareness) and how subtle differences in these objectives can affect the selection of indicators and the way in which a C&I initiative is carried out.

Understanding and Assessing Resilience

Adger, N. 2000. Social and ecological resilience: are they related? *Progress in Human Geography* 24(3): 347-364.

Abstract. This article defines social resilience as the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change. This definition highlights social resilience in relation to the concept of ecological resilience, which is a characteristic of ecosystems to maintain themselves in the face of disturbance. There is a clear link between social and ecological resilience, particularly for social groups or communities that are dependent on ecological and environmental resources for their livelihoods. But it is not clear whether resilient ecosystems enable resilient communities in such situations. This article examines whether resilience is a useful characteristic for describing the social and economic situation of social groups and explores potential links between social resilience and ecological resilience. The origins of this interdisciplinary study in human ecology, ecological economics and rural sociology are reviewed, and a study of the impacts of ecological change on a resource-dependent community in contemporary coastal Vietnam in terms of the resilience of its institutions is outlined.

Centre for Community Enterprise. 2000. The Community Resilience Manual: A Resource for Rural Recovery and Renewal. 95 pp.

Summary. The community resilience project was created as a resource to assist British Columbia's (BC) economically distressed rural towns. The outcome of a partnership between the Communities Committee of Forest Renewal and the Centre for Community Enterprise, the project seeks to help communities assess local circumstances and resources in order to best make decisions regarding the investment of resources.

Folke, C. 2006. Resilience: the emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16: 293-303.

Abstract. The resilience perspective is increasingly used as an approach for understanding the dynamics of social–ecological systems. This article presents the origin of the resilience perspective and provides an overview of its development to date. With roots in one branch of ecology and the discovery of multiple basins of attraction in ecosystems in the 1960–1970s, it inspired social and environmental scientists to challenge the

dominant stable equilibrium view. The resilience approach emphasizes non-linear dynamics, thresholds, uncertainty and surprise, how periods of gradual change interplay with periods of rapid change and how such dynamics interact across temporal and spatial scales. The history was dominated by empirical observations of ecosystem dynamics interpreted in mathematical models, developing into the adaptive management approach for responding to ecosystem change. Serious attempts to integrate the social dimension is currently taking place in resilience work reflected in the large numbers of sciences involved in explorative studies and new discoveries of linked social–ecological systems. Recent advances include understanding of social processes like, social learning and social memory, mental models and knowledge–system integration, visioning and scenario building, leadership, agents and actor groups, social networks, institutional and organizational inertia and change, adaptive capacity, transformability and systems of adaptive governance that allow for management of essential ecosystem services.

Folke, C., S. Carpenter, T. Elmqvist, L. Gunderson, C.S. Holling, B. Walker, J. Bengtsson, F. Berkes, J. Colding, K. Danell, M., Falkenmark, L. Gordon, R. Kasperson, N. Kautsky, A. Kinzig, S. Levin, K.G. Maler, F. Moberg, L. Ohlsson, P. Olsson, E. Ostrom,W., Reid, J. Rockstrom, H. Savenije and U. Svedin. 2002. *Resilience for Sustainable Development: Building Adaptive Capacity in a World of Transformations.* Environmental Advisory Council, Ministry of the Environment, Stockholm, 74pp.

Executive Summary. The goal of sustainable development is to create and maintain prosperous social, economic, and ecological systems. These systems are intimately linked: humanity depends on services of ecosystems for its wealth and security. Moreover, humans can transform ecosystems into more or less desirable conditions. Humanity receives many ecosystem services (such as clean water and air, food production, fuel, and others). Yet human action can render ecosystems unable to provide these services, with consequences for human livelihoods, vulnerability, and security. Such negative shifts represent loss of resilience. New insights have been gained during the last ten years about the essential role of resilience for a prosperous development of society. A growing number of case studies have revealed the tight connection between resilience, diversity and sustainability of social-ecological systems. In this report we provide an up-to-date synthesis of these case studies and recent insights, in the context of emerging theories of complex systems characterized by uncertainty and surprise. Resilience, for social-ecological systems, is related to (a) the magnitude of shock that the system can absorb and remain within a given state, (b) the degree to which the system is capable of self-organization, and (c) the degree to which the system can build capacity for learning and adaptation. Management can destroy or build resilience, depending on how the social-ecological system organizes itself in response to management actions. More resilient social-ecological systems are able to absorb larger shocks without hanging in fundamental ways. When massive transformation is inevitable, resilient systems contain the components needed for renewal and reorganization. In other words, they can cope, adapt, or reorganize without sacrificing the provision of ecosystem services. Resilience is often associated with diversity – of species, of human opportunity, and of economic options – that maintains and encourages both adaptation and learning. In general, resilience derives from things that can be restored only slowly, such as reservoirs of soil nutrients, heterogeneity of ecosystems on a landscape, or variety of genotypes and species. Social-ecological systems are constantly changing. Usually one assumes that ecosystems respond to gradual change in a smooth way, but sometimes there are drastic shifts. Regime shifts are known for many ecosystems and these shifts can be difficult, expensive, or sometimes impossible to reverse. Although we understand ecological regime shifts retrospectively, it is difficult to predict them in advance. Measurements or predictions of thresholds typically have low precision, and often ecological thresholds move over time. It is difficult to design assessment programs that learn as fast as thresholds change. One approach to the ongoing change of social-ecological systems has been the attempt to control or canalize change. Paradoxically, management that uses rigid control mechanisms to harden the condition of social-ecological systems can erode resilience and promote collapse. There are many examples of management that suppressed natural disturbance regimes or altered slowly changing ecological variables, leading to disastrous changes in soils, waters, landscape configurations or biodiversity that did not appear until long after the ecosystems were first managed. Similarly,

governance can disrupt social memory or remove mechanisms for creative, adaptive response by people, in ways that lead to breakdown of social-ecological systems. In contrast, management that builds resilience can sustain social-ecological systems in the face of surprise, unpredictability, and complexity. Resilience-building management is flexible and open to learning. It attends to slowly changing, fundamental variables that create memory, legacy, diversity, and the capacity to innovate in both social and ecological components of the system. It also conserves and nurtures the diverse elements that are necessary to reorganize and adapt to novel, unexpected, and transformative circumstances. Thus, it increases the range of surprises with which a socio-economic system can cope. Building social-ecological resilience requires understanding of ecosystems that incorporates the knowledge of local users. Thus the ecological ignorance of some contemporary societies undermines resilience. The outdated perception of humanity as decoupled from, and in control of, nature is an underlying cause of society's vulnerability. Technological developments and economic activities based on this perception further contribute to the erosion of resilience. It can be counteracted by understanding the complex connections between people and nature, which create opportunity for technological innovations and economic policies aimed at building resilience. Two useful tools for resilience building in social-ecological systems are structured scenarios and active adaptive management. People use scenarios to envision alternative futures and the pathways by which they might be reached. By envisioning multiple alternative futures and actions that might attain or avoid particular outcomes, we can identify and choose resilience-building policies. Active adaptive management views policy as a set of experiments designed to reveal processes that build or sustain resilience. It requires, and facilitates, a social context with flexible and open institutions and multi-level governance systems that allow for learning and increase adaptive capacity without foreclosing future development options. At least three general policy recommendations can be drawn from the synthesis of resilience in the context of sustainable development. The first level emphasizes the importance of policy that highlights interrelationships between the biosphere and the prosperous development of society. The second stresses the necessity of policy to create space for flexible and innovative collaboration towards sustainability, and the third suggests a few policy directions for how to operationalize sustainability in the context of social-ecological resilience. 1. Although most people appreciate that development is ultimately dependent on the processes of the biosphere, we have tended to take the support capacity of ecosystems for granted. This report illustrates that erosion of nature's support capacity leads to vulnerability. Policy should strengthen the perception of humanity and nature as interdependent and interacting and stimulate development that enhances resilience in social-ecological systems, recognizing the existence of ecological threshold, uncertainty and surprise. 2. Policy should stimulate the creation of arenas for flexible collaboration and management of social-ecological systems, with open institutions that allow for learning and build adaptive capacity. Policy frameworks with clear directions for action towards social-ecological resilience are required in this context (the EU watershed management directive is one example). They create action platforms for adaptive management processes and flexible multi-level governance that can learn, generate knowledge and cope with change. Such systems create a diversity of management options of significance for responding to uncertainty and surprise. 3. Policy should stimulate the development of indicators of gradual change and early warning signals of loss of ecological resilience and possible threshold effects. Policy should encourage monitoring of key ecosystem variables and aim to manage diversity for insurance to cope with uncertainty. Policy should stimulate ecosystem friendly technology and the use of economic incentives to enhance resilience and adaptive capacity. The development of monocultures should be avoided. Policy should provide incentives that encourage learning and build ecological knowledge into institutional structures in multi-level governance. Policy should invite participation by resources users and other interest groups and their ecological knowledge. Structured scenarios and active adaptive management processes should be implemented. Managing for resilience enhances the likelihood of sustaining development in a changing world where surprise is likely. Resilience building increases the capacity of a social-ecological system to cope with surprise. A changing, uncertain world in transformation demands action to build the resilience of the social-ecological systems, which embrace all of humanity. The need to account for resilience in a world of transformations is a perspective that should become embedded in strategies and policy of the World Summit on Sustainable Development and recognized in the next phases for implementation of Agenda 21.

Daniels, J.M. 2004. Assessing socioeconomic resiliency in Washington counties. General Technical Report. PNW-GTR-607. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 35 p.

Abstract. The link between forest management and the well-being of communities in forested areas has traditionally been defined by forest sector employment opportunities. Attempts to redefine this relationship have produced methods that use a more comprehensive approach by combining both economic and social indicators to evaluate community well-being. The goal of this study is to evaluate socioeconomic resilience and forest dependence in Washington counties in order to identify counties where changes in forest management could negatively affect the well-being of nearby residents, allowing land managers and decision makers to anticipate the effects of land management policies. Results indicate that Ferry, Pend Oreille, Pacific, Skamania, Stevens, and Wahkiakum Counties all have socioeconomic systems that could be particularly vulnerable to forest management changes. The same analyses were performed for the Washington Department of Natural Resources (DNR) by using only counties on the west side of the Cascade Range. Results show that two counties, Wahkiakum and Pacific, may experience disproportionate negative impacts from changes in DNR state forest management. These findings are preliminary in nature; findings should be reassessed using community-level data to determine the optimum geographic scale necessary for detailed evaluation of policy effects.

Harris, C.C., W.J. McLaughlin, and G. Brown. 1998. Rural communities in the interior basin: How resilient are they? *Journal of Forestry* 96 3(1): 11-15.

Abstract. An assessment of rural communities in Inland Northwest forests, completed for the Interior Columbia Basin Ecosystem Management Project, reveals that although their populations and economic base are changing, many towns are less dependent on natural resources than their citizens believe. Economic diversification is one measure of resilience to change, and towns whose leaders are preparing for future change have the best chance of expanding opportunities for their residents.

Hopkins, R. 2008. *The Transition Handbook: From Oil Dependency to Local Resilience.* Totnes, Devon: Green Books.

Summary. Considering the global issue of oil dependency and climate change, a new model called "the transition initiative" is developed for communities to work towards a lower-energy, more localized future. The concept of resilience, originally theorized within the discipline of ecology, is heavily drawn upon to inform the transition initiative, because of its emphasis on reorganization and change. Written for popular audiences, this book is organized so that communities may learn more about the issues associated with oil dependency and climate change, the concepts useful for addressing them, and how to develop practical and creative "transition" tools.

Maguire, B., and S. Cartwright. 2008. *Assessing a Community's Capacity to Manage Change: A Resilience Approach to Social Assessment*. Canberra: Australian Government Bureau of Rural Sciences.

Executive Summary. Australia is currently undergoing a process of water management reform, where the ways in which water is used across the country are being re-evaluated. It is anticipated that rural communities will be affected by this process as allocation systems are changed and refined. It is essential that the potential impacts on rural communities are understood, monitored and evaluated as these changes are developed and implemented. A robust social assessment approach is required to understand and assist with change in rural areas that may be affected by changes in water access. The resilience approach identifies the resources and adaptive capacity that a community can utilize to overcome the problems that may result from change. The approach builds upon the inherent capacities of a community, rather than only relying on external interventions to overcome vulnerabilities. Social assessment is a process of collecting, organizing and analyzing information about a community gathered through processes of stakeholder engagement. This document provides the

conceptual basis for a social assessment framework that, if implemented, will assist in identifying areas of priority for government intervention at a regional or national scale. This document discusses the relationships between vulnerabilities (the components which may weaken a community's ability to respond adaptively to a change), adaptive capacity (the resources and ability of a community to cope with change) and social resilience (the ability of a community to adaptively respond to change rather than simply returning to a pre-existing state). The framework points to measures of resilience that identify the capacity of communities and industries to adapt to changes in the availability, access or allocation of water. These social and economic measures of resilience can be integrated with biophysical information to identify communities and industries that are less resilient to changes in water availability. The approach recognizes that partnerships between governments and communities are the most effective means of implementing the social assessment process. The implementation of the approach will promote an understanding of resilience at the local level and enhance the skills of land-holders, community groups, other industry groups and governments to contribute to sustainable management of resources. Any social assessment is strengthened when it is approached as an ongoing process rather than as a one-off assessment. Governments and communities working together during a period of change can ensure that uncertainty, conflict, and resistance are minimized, while maximizing the chances of success of the reform process itself.

Marshall, N.A., D.M. Fenton, P.A. Marshall, S.G. Sutton. 2007. How resource dependency can influence social resilience within a primary resource industry. *Rural Sociology* 72(3): 359-390.

Abstract. Maintaining a healthy balance between human prosperity and environmental integrity is at the core of the principles of Ecological Sustainable Development. Resource-protection policies are frequently implemented so as to regulate the balance between resource access and use, however, they can inadvertently compromise the ability of resource users to adapt and be resilient. Resource users who are especially dependent on a resource are more seriously compromised. But how do we define and measure resource dependency? And how do we assess its ability to influence social resilience? In this study, a conceptual model of resource dependency is developed in terms of: (i) occupational attachment, (ii) attachment to place, (iii) employability, (iv) family attitude to change, (v) business size, (vi) business approach, (vii) financial situation, (viii) level of specialization, (ix) time spent harvesting, and (x) interest in and knowledge of the environment. The model of resource dependency and its effect on social resilience are (quantitatively and qualitatively) tested and explored using the commercial fishing industry in North Queensland, Australia. Results show that occupational attachment and employability were important influences as were business size and approach. Results can be used to identify vulnerability to institutional change and guide policy development processes.

Milman, A. and A. Short. 2008. Incorporating resilience into sustainability indicators: An example for the urban water sector. *Global Environmental Change* 18: 758-767.

Abstract. The development and use of indicators is common practice in efforts to promote urban sustainability. Indicators used to measure urban sustainability tend to focus narrowly on describing the current state of the urban system. Although a time series analysis using these indicators may lend insights into trends towards or away from certain 'sustainability' goals, existing indicators of urban sustainability do not provide information on the ability or the likelihood that the current system state can be maintained or improved over time. Indicators that incorporate a measure of system resilience would provide useful information on system sustainability. Through development of a new indicator, Water Provision Resilience (WPR), we provide an example of how measures of resilience could be incorporated into sustainability indicators. The new indicator adds six color codings to the existing indicator 'percent of the population with access to safe water.' Each color coding represents a measure of the ability of the water system to maintain or improve the current percent of the population with access to safe water in key areas of the water provision sector: supply, infrastructure, service provision, finances, water quality and governance. The metric is then applied to three cities. The goal in developing this metric is to provide a starting point for re-thinking the metrics used to measure progress and

sustainability in order to incorporate the ability to absorb and adapt to stresses into sustainability analysis.

University of Queensland and the University of Southern Queensland. 2008. Building Resilience in Rural Communities: Toolkit.

Summary. This toolkit is the outcome of a three-year research project that examined resilience in the context of psychological wellness in a rural Australian community. The study identifies eleven factors that enhance resilience at both the individual and community level: social networks and support; positive outlook; learning; early experiences; environment and lifestyle; infrastructure and support services; sense of purpose; diverse and innovative economy; embracing differences; beliefs; and leadership. Resilience is understood as a fluid process that can vary over time and circumstances and as such, the toolkit is designed for use by community workers, health professionals and others working to foster positive change for individuals and groups in a community setting.

Walker, B., S. Carpenter, J. Anderies, N. Abel, G. Cumming, M. Janssen, L. Lebel, J. Norberg, G.D. Peterson, and R. Pritchard. 2002. Resilience management in social-ecological systems: A working hypothesis for a participatory approach. *Conservation Ecology* 6(1): 14 [online] URL: http://consecol.org/vol6/iss1/art14.

Abstract. Approaches to natural resource management are often based on a presumed ability to predict probabilistic responses to management and external drivers such as climate. They also tend to assume that the manager is outside the system being managed. However, where the objectives include long-term sustainability, linked social-ecological systems (SESs) behave as complex adaptive systems, with the managers as integral components of the system. Moreover, uncertainties are large and it may be difficult to reduce them as fast as the system changes. Sustainability involves maintaining the functionality of a system when it is perturbed, or maintaining the elements needed to renew or reorganize if a large perturbation radically alters structure and function. The ability to do this is termed "resilience." This paper presents an evolving approach to analyzing resilience in SESs, as a basis for managing resilience. We propose a framework with four steps, involving close involvement of SES stakeholders. It begins with a stakeholder-led development of a conceptual model of the system, including its historical profile (how it got to be what it is) and preliminary assessments of the drivers of the supply of key ecosystem goods and services. Step 2 deals with identifying the range of unpredictable and uncontrollable drivers, stakeholder visions for the future, and contrasting possible future policies, weaving these three factors into a limited set of future scenarios. Step 3 uses the outputs from steps 1 and 2 to explore the SES for resilience in an iterative way. It generally includes the development of simple models of the system's dynamics for exploring attributes that affect resilience. Step 4 is a stakeholder evaluation of the process and outcomes in terms of policy and management implications. This approach to resilience analysis is illustrated using two stylized examples.

Varghese, J., N.T. Krogman, T.M. Beckley, S. Nadeau. 2006. Critical analysis of the relationship between local ownership and community resiliency. *Rural Sociology* 71(3): 505-527.

Abstract. Collectively, current resource-development literature has given little attention to organizational features of ownership as important variables in community resilience. By drawing from six local buyout cases in Canada's forest sector, we reveal the complexity and numerous constraints on local ownership and expose a more nuanced context than most sociologists tend to consider. Our findings suggest that the meaning of local ownership and community resilience varies depending upon the composition (e.g., private vs. public; mill vs. forest license vs. coupled mill & forest license), type (social, cooperative, trust and/or direct-share ownership), extent of ownership (percentage of local versus extra-local shares), and the level of control (e.g., proportion of locally held seats on the Board of Directors) associated with ownership. Future research on local ownership should more carefully differentiate between the nature of local ownership and its associated outcomes.

Vulnerability and Adaptability Assessment

Adger, N. and P. Kelly. 1999. Social vulnerability to climate change and the architecture of entitlements. *Mitigation and Adaptation Strategies for Global Change* 4: 253-266.

Abstract. The objective of this paper is to outline a conceptual model of vulnerability to climate change as the first step in appraising and understanding the social and economic processes which facilitate and constrain adaptation. Vulnerability as defined here pertains to individuals and social groups. It is the state of individuals, of groups, of communities defined in terms of their ability to cope with and adapt to any external stress placed on their livelihoods and well-being. This proposed approach puts the social and economic well-being of society at the centre of the analysis, thereby reversing the central focus of approaches to climate impact assessment based on impacts on and the adaptability of natural resources or ecosystems and which only subsequently address consequences for human well-being. The vulnerability or security of any group is determined by the availability of resources and, crucially, by the entitlement of individuals and groups to call on these resources. This perspective extends the concept of entitlements developed within neo-classical and institutional economics. Within this conceptual framework, vulnerability can be seen as a socially constructed phenomenon influenced by institutional and economic dynamics. The study develops proxy indicators of vulnerability related to the structure of economic relations and the entitlements which govern them, and shows how these can be applied to a District in coastal lowland Vietnam. This paper outlines the lessons of such an approach to social vulnerability for the assessment of climate change at the global scale. We argue that the socio-economic and biophysical processes that determine vulnerability are manifest at the local, national, regional and global level but that the state of vulnerability itself is associated with a specific population. Aggregation from one level to another is therefore not appropriate and global-scale analysis is meaningful only in so far as it deals with the vulnerability of the global community itself.

Donoghue, E. M., and Haynes, R. W. 2002. *Assessing the Viability and Adaptability of Oregon Communities*. Portland, OR: United States Department of Agriculture, Forest Service.

Abstract. This work responds to the need to assess progress toward sustainable forest management as established by the Montréal Process Criteria and Indicators. The focus is on a single indicator (commonly referred to as Indicator 46) that addresses the "viability and adaptability to changing economic conditions, of forest-dependent communities, including indigenous communities." Communities in Oregon were assessed in terms of their connectivity to service centers, socioeconomic well-being, and proximity to public lands. Fifty-four communities rated relatively low in these combined characteristics and were considered less adaptable to changing socioeconomic conditions.

Parkins, J.R. and N.A. MacKendrick. 2007. Assessing community vulnerability: a study of the Mountain Pine Beetle outbreak in British Columbia, Canada. *Global Environmental Change* 17: 460-471.

Abstract. Arguing that community-based assessments of vulnerability to climate change are congruent with the scale at which policy action takes place, this paper presents an assessment of vulnerability conducted in forest-based communities surrounded by a catastrophic outbreak of forest disease. Our assessment includes measures of several dimensions of vulnerability, developed using an interdisciplinary and participatory research process. We find that for some communities vulnerability represents a high level of economic risk, while for others risk is exacerbated by institutional limitations. We also find that community perceptions of risk and bio-physical assessments differ widely for communities anticipating future outbreaks of disease.

Pelling, M. and C. High. 2005. Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change* 15: 308–319

Abstract. The burgeoning interest in social capital within the climate change community represents a welcome move towards a concern for the behavioural elements of adaptive action and capacity. In this paper the case is put forward for a critical engagement with social capital. There is need for an open debate on the conceptual and analytical traps and opportunities that social capital presents. The paper contrasts three schools of thought on social capital and uses a social capital lens to map out current and future areas for research on adaptation to climate change. It identifies opportunities for using social capital to research adaptive capacity and action within communities of place and communities of practice.

Sustainability, Environmental, Cumulative, and Social Impact Assessment

Christensen, L. 2008. Perceptions of Change in Southwest Yukon: Implications for the Study of Cumulative Effects and Social Thresholds. Thesis. University of Alberta, Department of Rural Economy.

Abstract. This research focuses on contemporary and historical relationships between landscape change and human impacts in southwest Yukon, Canada, in order to bring to light the nature of cumulative social effects, and culturally appropriate methodologies that may be used for their evaluation. Results were acquired through twenty-eight semi-structured interviews with natural resource managers, health and social workers, First Nations, and non-First Nations residents, in which resource development, and other important local markers of change were topics of discussion. Social thresholds are also developed from these results for their use in supporting resource management decisions. Resilience theory plays a center role in this work, because it provides a unique framework for understanding human responses to change and recognizing the diverse roles people play as agents and recipients of change, particularly in terms of how social learning, over time, is applied to manage new resource activities.

Baxter, W., W.A. Ross, and H. Spaling. 2001. Cumulative effects assessment: Improving the practice of cumulative effects assessment in Canada. *Impact Assessment and Project Appraisal* 19(4): 253-262.

Abstract. This paper presents the findings of a critical evaluation of 12 Canadian cumulative effects assessment (CEA) documents, and offers responsive interpretation and recommendations. The evaluation focused on environmental impact assessment (EIA) documents for which CEAs have been required. A variety of types of document have been reviewed — different jurisdictions (both provincial and federal), different types of project, and different levels of EIA (comprehensive studies and major panel reviews). Findings show that: CEA is inadequately distinguished from EIA; scoping is inadequate; and cumulative effects analysis and follow-up are weak. Based on the results of the evaluation, four actions are recommended to improve the professional practice of CEA: include CEA considerations in terms of reference; use context scoping; use more follow-up studies; and link project and regional CEA.

Duinker, P. and L. Greig. 2006. The impotence of cumulative effects assessment in Canada: Ailments and ideas for redeployment. *Environmental Management* 37(2): 153-161.

Abstract. Cumulative effects assessment (CEA) in Canada is in dire straits. Despite a huge amount of talk and a flurry of developmental activity associated with CEA concepts, it has not lived up to its glowing promise of helping to achieve sustainability of diverse valued ecosystem components. This article aims to articulate that

failure, to examine it in terms of six major problems with CEA, and to propose solutions. The six problem areas include (1) application of CEA in project-level environmental impact assessments (EIAs), (2) an EIA focus on project approval instead of environmental sustainability, (3) a general lack of understanding of ecologic impact thresholds, (4) separation of cumulative effects from project-specific impacts, (5) weak interpretations of cumulative effects by practitioners and analysts, and (6) inappropriate handling of potential future developments. We advocate improvements not only within the purview of project-specific EIAs, but also mainly in the domain of region-scale CEAs and regional environmental effects frameworks (or perhaps land use planning). Only then will the CEA begin to approach the promise of securing sustainability of valued ecosystem components.

Gasparatos, A., M. El-Haram, and M. Horner. 2008. A critical review of reductionist approaches for assessing the progress towards sustainability. *Environmental Impact Assessment Review* 28: 286-311.

Abstract. The increasing prominence of Sustainable Development as a policy objective has initiated a debate on appropriate frameworks and tools that will both provide guidance for a shift towards sustainability as well as a measure, preferably quantitative, of that shift. Sustainability assessment has thus the challenging task of capturing, addressing and suggesting solutions for a diverse set of issues that affect stakeholders with different values and span over different spatial and temporal scales. However, sustainability assessment is still not a mature framework in the sense that Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) are. This paper aims to provide suggestions for improving the sustainability evaluation part of a sustainability assessment. In particular it will provide a comprehensive review of different sustainability evaluation tools (from a reductionist perspective) as well as the feasibility of incorporating them within a sustainability assessment framework. Reviewed tools include monetary tools, biophysical models and sustainability indicators/composite indices that have been developed within different disciplines such as economics, statistics, ecology, engineering and town planning.

Hunsberger, C.A., R.B. Gibson, and S.K. Wismer. 2005. Citizen involvement in sustainability-centered environmental assessment follow-up. *Environmental Impact Assessment Review* 25: 609-627.

Abstract. In Canada, many project proponents and planners in the public and private sectors are required to forecast and minimize the adverse environmental effects of their undertakings. However, environmental assessments have traditionally been weak in the areas of planning and conducting effective monitoring, encouraging public participation, integrating social and ecological considerations, encouraging environmental rehabilitation and enhancement, and examining cumulative effects of multiple projects. This paper attempts to address these deficiencies together by drawing from theory and practice in citizen-based monitoring, in the interests of sustainable livelihoods, using local knowledge. Informed by case study research in several regions of Canada, the discussion focuses on opportunities for using citizen-based approaches to broad and continuing regional monitoring as a foundation for the project-centered work that is the usual concern of environmental assessment follow-up. Such approaches have advantages beyond the usual expectations of project-centered monitoring and beyond the conventional arguments for increasing local involvement in environmental assessments. However, there are also challenges including those of integrating local and conventional (or scientific) knowledge systems, addressing concerns about the credibility and biases of citizens and project proponents, ensuring attention to broader sustainability goals such as increased stewardship and civility, and developing practical ways of coordinating and funding integrated and participatory monitoring programs. The concluding recommendations call for a dramatically different approach to follow-up activities on the part of private and public project proponents, as well as novel thinking for environmental assessment practitioners.

Noble, B.F. 2002. The Canadian experience with SEA and sustainability. *Environmental Impact Assessment Review* 22(1): 97-111.

Abstract. The project-specific nature of current environmental assessment (EA) practice is often seen as a constraint on accounting for sustainability. Sustainability will only be realized if consideration is given to the environment at all significant decision points; this includes decisions at the policy, plan and program (PPP) level. Strategic EA (SEA), the EA of proposed and existing PPP and their alternatives, is gaining widespread recognition as a supporting tool for decision making towards achieving sustainable development. This paper discusses some key principles and characteristics that should underpin the SEA process if SEA is to contribute to the design of more sustainable policies and strategies, and explores the current state-of-the-art of SEA in Canada.

Noble, B.F. and K. Storey. 2005. Towards increasing the utility of follow-up in Canadian EIA. *Environmental Impact Assessment Review* 25(2): 163-180.

Abstract. The importance of follow-up in the EIA process is clearly recognized in the Canadian Environmental Assessment Act (Act) in which, where it is considered appropriate, the responsible authority for a project will design a follow-up program and ensure its implementation. The Act is also explicit in recommending that the results of follow-up programs be used to improve the quality of environmental assessments (EAs). The purpose of this paper is to examine whether the specific requirements for follow-up under the Act in fact provide the best opportunity for such quality improvements. The definition of follow-up under the Act requires the verification of the accuracy of the environmental assessment and determination of the effectiveness of measures taken to mitigate the adverse environmental effects of a project. We argue that the Act, generally, and the requirements for follow-up specifically, adopts a negative perspective towards project effects by focusing on the mitigation of adverse effects and discourages the follow-up of important social or economic effects which are independent of project-related changes to the biophysical environment. Secondly, we argue that verification of accuracy places an unwarranted emphasis on 'what was expected' rather than on 'what was wanted' in terms of environmental outcomes. Using examples from Canadian experience, we illustrate the limitations of the current approach to follow-up and suggest that greater utility would be achieved by focusing on whether the environmental objectives of the project in question have been achieved.

O'Faircheallaigh, C. 1999. Making social impact assessment count: A negotiation-based approach for indigenous peoples. *Society and Natural Resources* 12:63-80.

Abstract. In the past, indigenous people have often been entirely excluded from social impact assessments (SIAs) of projects or activities that affect them, or have faced major financial and cultural barriers in participating effectively and in having their perspectives accepted as legitimate. More recently, indigenous groups have achieved greater success in influencing SIA, but a fundamental problem remains. Their enhanced input into SIA has generally not increased the capacity of indigenous people to shape the outcomes of development projects in ways that favor their interests. This problem reflects a wider failure, extensively documented in the literature, to integrate SIA into decision-making. Drawing on case studies from Australia's Cape York Peninsula, this article shows how SIA can be integrated into the negotiation of legally binding agreements between developers and indigenous groups, offering a practical and effective way of ensuring that SIA findings influence the development and operation of resource projects. While the case studies relate to specific regional, political, and cultural contexts, the general approach outlined in the article should be of interest to indigenous communities and SIA practitioners.

—. 2007. Environmental agreements, EIA follow-up and aboriginal participation in environmental management: The Canadian experience. *Environmental Impact Assessment Review* 27: 319-342.

Abstract. During the last decade a number of environmental agreements (EAs) have been negotiated in Canada

involving industry, government and Aboriginal peoples. This article draws on the Canadian experience to consider the potential of such negotiated agreements to address two issues widely recognized in academic and policy debates on environmental impact assessment (EIA) and environmental management. The first relates to the need to secure indigenous participation in environmental management of major projects that affect indigenous peoples. The second and broader issue involves the necessity for specific initiatives to ensure effective follow-up of EIA. The Canadian experience indicates that negotiated environmental agreements have considerable potential to address both issues. However, if this potential is to be realized, greater effort must be made to develop structures and processes specifically designed to encourage Aboriginal participation; and EAs must themselves provide the financial and other resources required to support EIA follow-up and Aboriginal participation.

Pope, J., D. Annandale, and A. Morrison-Saunders. 2004. Conceptualizing sustainability assessment. *Environmental Impact Assessment Review* 24: 595-616.

Abstract. Sustainability assessment is being increasingly viewed as an important tool to aid in the shift towards sustainability. However, this is a new and evolving concept and there remain very few examples of effective sustainability assessment processes implemented anywhere in the world. Sustainability assessment is often described as a process by which the implications of an initiative on sustainability are evaluated, where the initiative can be a proposed or existing policy, plan, program, project, piece of legislation, or a current practice or activity. However, this generic definition covers a broad range of different processes, many of which have been described in the literature as 'sustainability assessment'. This article seeks to provide some clarification by reflecting on the different approaches described in the literature as being forms of sustainability assessment, and evaluating them in terms of their potential contributions to sustainability. Many of these are actually examples of 'integrated assessment', derived from environmental impact assessment (EIA) and strategic environmental assessment (SEA), but which have been extended to incorporate social and economic considerations as well as environmental ones, reflecting a 'triple bottom line' (TBL) approach to sustainability. These integrated assessment processes typically either seek to minimize 'unsustainability', or to achieve TBL objectives. Both aims may, or may not, result in sustainable practice. We present an alternative conception of sustainability assessment, with the more ambitious aim of seeking to determine whether or not an initiative is actually sustainable. We term such processes 'assessment for sustainability'. 'Assessment for sustainability' firstly requires that the concept of sustainability be well-defined. The article compares TBL approaches and principles-based approaches to developing such sustainability criteria, concluding that the latter are more appropriate, since they avoid many of the inherent limitations of the triple-bottom-line as a conception of sustainability.

Ross, H. 1990. Community social impact assessment: A framework for indigenous peoples. *Environmental Impact Assessment Review* 10: 185-193.

Abstract. A community social impact assessment framework for indigenous peoples has been developed on the basis of a study conducted with a group of East Kimberley Aboriginal communities in Western Australia. The framework involves community control, with emphasis on community, values, perspectives, and social context. It requires research methods that Aboriginal people feel comfortable using and that represent their viewpoints effectively. It incorporates a cumulative regional and historical view, and takes a social developmental approach.