ENVIRONMENTAL ASSESSMENT AND LONG TERM MANAGEMENT

Peter Royston Mulvihill

A Manuscript Report Prepared for the
The Canadian Environmental Assessment Research Council
July 1993

ACKNOWLEDGEMENTS

I am grateful to CEARC for its financial support, guidance and encouragement. Along with many other EA researchers, I am appreciative of CEARC's innovative contributions to environmental assessment and management over the years. Well done!

Many thanks to Professor Peter Jacobs for supporting, sharing, guiding and pushing my research with uncommon energy, purpose, dedication and vision.

Special thanks to Caroline.

Executive Summary

Environmental assessment (EA) has traditionally been a “front end” process, concentrating on the prediction of impacts and virtually ending at the decision stage. There is increasing interest in the “back end” of the EA process - in making EA an instrument for the management of impacts over time. This report explores the potential expansion of EA into a long term management instrument. Principles for a successful transition are proposed, and several frameworks, theories and strategies are discussed in terms of their likely contribution. Reference is made to case studies drawn from Canada’s north.

Dans cette recherche, on examine le potential de l'évaluation environnementale (EE) pour devenir un outil pour gerer les impactes a long terme. Plusieurs cadres conceptuels et strategies pour gestion a long terme sont évalués, et des principes sont proposes. Des etudes de cas sont tires du nord Canada.

CONTENTS

Introduction

This report to the Canadian Environmental Assessment Research Council addresses the potential application of long-term environmental management principles and practices through the improvement and expansion of environmental assessment (EA) processes and techniques. Long term management is defined generally as an extended, intergenerational perspective and approach to resource management and policy, programme and project design. In the context of EA, long term management implies a more open-ended process as opposed to traditional, "closed" processes emphasizing prediction and approval without adequate provisions for follow up.

Particular attention in this report is given to case studies in Canada's north. The questions guiding the research are as follows:

- Is EA, given its nature and potential, an appropriate instrument for long term environmental management?
- If so, which approaches, directions and reforms appear promising in applying EA as an instrument for long term management?
- What frameworks may be used?
- What, if anything, has been accomplished to date in making EA an instrument for long term management in the case study area (Canada's north)? What needs to be done?

The report is divided into three main parts. In Part One, some of the theoretical and methodological limits of environmental assessment are discussed and a critique of EA as currently practiced is offered. A brief historical overview of environmental assessment is provided, and some of the problem areas, as well as points of consensus and controversy surrounding environmental assessment are discussed. The major limits of environmental assessment are then analyzed. A brief discussion of the experience of environmental assessment in northern Canada follows, and the section concludes with a discussion of the possibility of EA being expanded to include a long-term management role.

Part Two discusses specific theories and measures which may help environmental assessment assume an effective long-term management role. It begins with a discussion of the principles which must underlie such a transition, and concludes with an evaluation of various theories, strategies and frameworks from which the practice of long-term management may derive.

Finally, Part Three discusses the potential operationalization of environmental assessment and long-term management in Canada's north with reference to past, present and future initiatives.

1. Theoretical and Methodological Limits of Environmental Assessment

Background

The practice of environmental assessment was instituted in the late 1960's in the United States in response to general environmental concerns and specific concerns about the unanticipated negative impacts of projects. In Canada the federal government created its own environmental assessment process in the early 1970's. Since that time, a number of provincial, territorial and aboriginal land claim-based environmental assessment processes have also appeared. Environmental assessment is now widely practiced in Canada, the United States and elsewhere. Until the 1980's most theorists and practitioners employed the term "environmental impact assessment"; "environmental assessment", however, has gradually become the term of choice. The two terms are now used virtually interchangeably; the present author prefers the latter term.

In Canada a considerable number of projects have been subject to environmental assessment procedures over the past two decades. The undertakings range from small projects to "mega-projects" such as Hydro Quebec's James Bay program. Undertakings other than those defined as "projects" have also been subject to environmental assessment. Depending upon the particular jurisdiction, "concept"

and "class" environmental assessments have also taken place. More recently, proposals have been made to assess government policies and programs. Many proponents of environmental assessment would like to see its scope of application expanded to include, even automatically, the entire range of public and private human activities that may have significant environmental and social impacts.

Like the environmental movement, environmental assessment has evolved considerably. The concept and practice of environmental assessment have expanded over time; new procedures and techniques have been introduced. Some of these include the increasing consideration of social impacts; recognition of cumulative and transboundary effects; tentative linkages to related processes; greater opportunities for public participation and scrutiny; increasing emphasis on the justification of projects; and a number of theoretical/scientific frameworks for impact prediction (Jacobs and Sadler, 1990).

Consensus and Controversies

Although definitions of environmental assessment vary depending upon the various demands placed upon the process by individuals and groups, most would agree on a basic definition such as that proposed by Richardson:

"The basic idea of EIA is quite straightforward: to scrutinize a development scheme while it is still in the planning stage (sometimes by examining an 'impact statement' prepared by the proponent) in order to ensure that the expected effects on the environment are acceptable and to require such corrective or mitigative measures to

be incorporated as seem necessary; or in extreme cases, to reject the project altogether." (Richardson, 1989, p. 28)

This apparent consensus is deceptive, however, because there is considerable disagreement as to the overarching purpose of environmental assessment, just as there is a range of perceptions and values concerning the purposes of development. Sadler, for example, proposes a view of environmental assessment that the present author agrees with, but that those who favour a much more restrictive application of environmental assessment would dispute:

"Environmental assessment, in principle, was adopted to ensure that development is sustainable, that is, development does not irreversibly damage essential ecological processes and/or foreclose other resource values and options for use." (Sadler, in Jacobs and Sadler, 1990, p. 172)

A more restrictive view of environmental assessment, and one which does not reflect an endorsement and internalization of sustainable development, views it as a process designed merely to predict impacts. In this more restrictive view, the ultimate decision whether or not to accept the negative environmental and social impacts that development entails is a fundamentally political one; one which presumably weighs costs and benefits. The utility of environmental assessment, the latter would argue, is that it provides information that may be weighed in the making of such political decisions. Thus, even decisions to use resources unsustainably are informed decisions, since the process has helped make the choices clear.

There are thus two competing views of environmental assessment - one restrictive, the other more expanded - and considerable middle ground. It is in this context that criticisms of environmental

assessment should be considered. While there may never be unanimity concerning the goals of environmental assessment, it is argued that the emerging ethos of sustainable development is strong enough to provide a sound basis for concluding that the "expanded" view of environmental assessment is becoming the prevailing vision. Most theorists and practitioners want environmental assessment to have a broad mandate and to be an integral instrument of sustainable development. Moreover, as Sadler suggests, expectations have justifiably arisen that environmental assessment should not only be one of several interrelated processes that together provide tools for sustainable development - it should be regarded as one of the central processes:

"...EA is both a reference and entry point for analysis of the problems encountered in designing integrated approaches to resource and environmental management". (Sadler, in Lang et al, 1990, p. 99)

In other words, it seems reasonable to hope that environmental assessment may be one of the principal vehicles in the pursuit of sustainable development.

Towards expanded EA

To summarize, there is ongoing tension between the more restrictive and the more expanded view of environmental assessment. In the more expanded view, proposed undertakings are evaluated on the basis of sustainability and equity criteria, impacts are managed rather than merely predicted, and development is viewed as dynamic and iterative. Throughout the process, the approach is one of continuing evaluation, learning, adaptation and feedback for quality control. Expanded EA might feature, among other things, a

philosophy of adaptive management; greater sensitivity to cross-cultural development issues and diverse knowledge systems; an ecosystem approach to assessment; a pluralistic view of project design; policy-level assessment; provisions for alternative dispute resolution; and greater applicability to informal undertakings and contexts. (Jacobs, Mulvihill and Sadler, 1993)

The actual performance of environmental assessment in Canada and elsewhere is reviewed next against the normative criteria outlined above. The intent is to discuss some of the main shortcomings and accomplishments of EA in order to explore its limits and assess its potential and appropriateness as an instrument for long-term management.

Limits of Environmental Assessment

Environmental assessment has been subject to a steady stream of criticism since its inception. Most of this criticism relates to questions of "effectiveness", "efficiency" and "fairness"; this threefold analysis of environmental assessment has become a standard, although insufficient, critical framework. Specific criticisms of environmental assessment (EA) have included, but are by no means limited to the following:

- EA is an essentially reactive process: "The fundamental criticism of EIA in Canada is that it is often applied as a reactive and discrete activity, loosely related to the broader process of environmental decision-making." (Marshall et al, 1985, p.4) Many critics have

argued that the environmental assessment processes begins too late, once the design variants of projects have been substantially determined. The ability of the process to influence the nature and design of development activity is thus constrained.

- The scope and mandate of EA is too narrow. The terms of reference for many environmental assessment panels have constrained or precluded their abilities to consider such important issues as the full range of social impacts; cumulative effects; the complete range of alternative ways of carrying out the project and alternatives to the project itself; and the basic justification of the proposed undertaking. In many cases the definition of "environment" employed in EA is rather narrow. There appears to be a general trend, however, toward expansion of scope and mandates - partly a result of ongoing criticism.

- Lack of comprehensiveness. EA often fails to consider and predict the full range of potential impacts, and often neglects to identify some of the most important effects. (for example, Berkes, 1988)

- Lack of application. Many undertakings with significant environmental impacts have been exempted from environmental assessment for political reasons.

- Constraints to public participation and scrutiny. Although EA processes in general have become more open and transparent over time, many jurisdictions either have failed or still fail to provide

what critics consider to be adequate opportunities for public involvement.

- The inappropriateness of self-assessment. In most EA processes the proponent of the undertaking is responsible for preparing an environmental impact statement. Many critics argue that the lack of independent study unfairly biases the study of impacts, even though the public and the EA panel have the opportunity to review the proponent's findings.

- Lack of follow-up and enforceability. Critics point out that many projects have undergone environmental assessment and review, only to have proponents subsequently ignore the recommendations of the panel.

- Lack of policy context, or lack of clarity of policy frameworks. Critics have argued that the task of EA is constrained by lack of environmental policy. EA panelists have frequently been asked to evaluate the acceptability of projects, impacts and mitigative measures without sufficient policy guidance. (Richardson, 1989, p. 29) This critique is echoed by Rees:

"Critics of 'traditional' EA have long complained that in the absence of a broader policy and planning context, it is impossible to assess the significance of impacts associated with isolated single projects." (Rees, in Jacobs and Sadler, 1990, p.137)

- Science-based deficiencies of impact analysis. (Marshall, 1985, p. 8) As noted above, EA processes often fail to identify or predict

important impacts. (e.g. even if a formal environmental assessment of Hydro-Quebec's La Grande project had been done, it is doubtful that methyl-mercury contamination would have been predicted) EA's predictive limitations are largely attributable to scientific deficiencies - analytical techniques are in evolution, and attempts to model ecological systems and impacts have been only modestly successful. As will be discussed later, however, proponents of alternative frameworks such as Adaptive Environmental Assessment and Management (Holling, 1978) view uncertainty in a different manner than "rational comprehensive" impact predictors and planners. In any case, environmental assessment is confronted with a generic problem that faces most scientific disciplines: how can uncertainty be dealt with?

- Overlaps and omissions in institutional arrangements. (Marshall, 1985, p. 9) Linkages between environmental assessment and related processes are often poorly defined and operationalized. Moreover, linkages among the various steps in environmental assessment are often poorly operationalized. The frequent result is that the efforts of environmental assessment are poorly integrated into management and decision-making.

- It should also be noted that project proponents have levelled their own criticisms at environmental assessment, noting that EA processes can be too long, too costly, too inefficient, too uncertain and too ambitious. Proponents have often resisted the intent and goals of environmental assessment. On the other hand, they have contributed

positively to its development, and in many sectors have shown evidence of intemalizing its goals.

In summary, based upon criticisms of environmental assessment over the last twenty years, we may characterize perceptions of the limitations and failings of environmental assessment in the following ways:

- EA's ability to predict impacts is limited. This is a very serious limitation since many observers (particularly those who take a restrictive view) consider this to be EA's primary role.

- There are questions of fairness, openness, rigour of application and due process.

- EA is poorly integrated with related processes.

- It is too reactive and project-specific.

- It is too narrow in scope, and to a great extent operates in a policy vacuum.

In summary: these are not proposed as definitive judgements based on rigorous analysis, but rather are offered as a collection of common criticisms and perceptions of EA as practiced in Canada. Together they provide a general, if somewhat harsh, picture of EA - a background against which future reforms may be contemplated. The

overall impression of EA is perhaps that of a promising and evolving instrument, the full potential of which remains untapped.

The northern Canadian experience

The experience of environmental assessment in northern Canada is mixed. A wide range of projects have been reviewed by the Federal Environmental Assessment and Review Process, and regional or land claim organizations such as the Kativik Environmental Quality Commission in Northern Quebec and the Environmental Impact Review Board in the Western Arctic. (Mulvihill and Keith, 1989; Keith and Mulvihill,1992) In fact, the scale and nature of such development projects as the Mackenzie Valley Pipeline, the Beaufort Sea Oil Drilling Program and the James Bay Hydroelectric Projects have made northern Canada a kind of laboratory for the testing of environmental assessment. The corollary is that these exercises have also confirmed some of the limitations of environmental assessment.

In the wake of the public inquiry of the proposed Mackenzie Valley Pipeline in the 1970's (not an environmental assessment per se, but a process that had many of the features of EA) the Chairman of the inquiry, Justice Thomas Berger noted that "the limits of planning" became apparent through his experience. He noted a "vast difference between impacts and those that will be important in 10 years", the fact that "even short-term causal chains can be intricately connected", and that:

"Other consequences can be predicted only in a vague and general way: we can anticipate their scale, but cannot adequately plan for them." (Berger, 1977, p. 210)

The Beaufort Sea Environmental Assessment Process (BEARP) was a costly, lengthy exercise that left many observers and participants frustrated. (Canadian Arctic Resources Committee, Northern Perspectives, 1984) Critics felt that BEARP shed little light on the acceptability of oil drilling in the Beaufort Sea area, and that this failure raised questions about the utility of environmental assessment processes in general. Others felt that a fundamental flaw of BEARP was its vague mandate. Sadler (1990) offers a more comprehensive evaluation, and concludes that BEARP's accomplishments were considerable given a number of quite significant constraints.

The current environmental assessment and review of Hydro-Quebec's proposed Great Whale project reflects a continuing experimentation with EA. This joint review exercise seeks to study cumulative effects; integrate the consideration of biophysical and social impacts; review alternatives to the project in a broad context which addresses energy policy; maximize public participation and scrutiny; and, most importantly, consider the proposed project in the context of sustainable development. Moreover, the guidelines submitted to the proponent in 1992 require that a plan for the long-term management of the project be included in the environmental impact statement. In this regard, the Great Whale review is addressing explicitly what many critics consider to the principal failing of environmental assessment: its failure to pay attention to the "back end" of the process, or to ensure "follow-up" and

monitoring of effects. The draft guidelines for the Great Whale impact statement also go beyond this and require that "long-term management" be provided for or arranged by the proponent.

The potential long-term management role of environmental assessment

In addition to the theoretical and practical limitations discussed above, questions have been raised concerning the adaptiveness of environmental assessment and the failure of legislators and practitioners to incorporate a coherent and effective "follow-up" dimension into EA. In fact, it is the main contention of this report that increasing attention to "follow-up" or the "back end of environmental assessment" currently constitutes the most important movement in the theoretical development of EA. This movement, it is argued, has the potential to transform environmental assessment from a reactive tool focussed on impact prediction into a management tool focussed on principles of sustainable development. But first let us review what theorists have said about the neglected "back end" of environmental assessment.

In the evolution of environmental assessment, new ideas have often aged considerably before being put into practice; there is a characteristic time lag between the conceptualization and operationalization of improvements. For example, the full consideration of social and cumulative impacts were advocated long before environmental assessment regimes began to reflect their recognition. This is largely because approaches to environmental

assessment have become rigidly formalized and entrenched through legislation and other means, without allowing for the eventuality of new imperatives and techniques (Mulvihill and Keith, 1989).

Likewise, recognition of the need for greater attention to the follow-up component is not new. Some authors in the 1970's and early 1980's were advocating "phased" approaches to environmental assessment, or "tiering". Lee, for example, argued that "the assessment process may be more cyclic than linear in nature", and that "the stages in planning and decision processes at which an EIA might best be carried out, the choice of assessment methods appropriate to each stage, and the importance of adaptability as an ingredient in such a tiered system" were important considerations. (Lee, 1980, p. 78, 71)

Throughout the 1980's, authors have called for the inclusion of post-approval monitoring as an integral part of environmental assessment. Marshall identified this as an overarching need: "More than anything else, however, the lack of commitment to post project monitoring has constrained the advance of the field" (Marshall et al, 1985, p. 26) The Canadian Environmental Assessment Research Council, for its part, has often noted the need for monitoring:

> "Environmental evaluation, therefore, should not be a one-time event, but rather a continuing activity providing information and knowledge on environmental conditions and ecosystem responses for inclusion in the project management process." (CEARC, 1988)

It is interesting to note that much of the earlier literature concerning environmental assessment noted that the process did not apply early

enough in project design; current literature notes that it does not apply late enough in project implementation.

More recently, De Laet submitted that the conception and application of environmental assessment both need to be expanded:

> "There is, however, a need for EIA processes to have the capacity to follow through on their final decisional 'loop' and insure (sic) that the conditions attached to the project approval are in fact observed. This validating mechanism usually falls outside the purview and mandate of the EIA agency." (De Laet, in Jacobs and Sadler 1990, p. 167)

Finally, Sadler argues that a broader role for environmental assessment, based on long-term management, is necessary:

> "An improved model of Canadian practice in impact assessment is beginning to emerge in tentative form. The next task is to structure and flesh this out. It involves forging a linkage between impact assessment, policy planning and project implementation and evaluation." (Sadler, in Lang, 1990, p. 111)

Sadler refers to this emerging practice as "post-project audit and review". Finally, Jacobs and Sadler, in their recommendations to the Canadian Environmental Assessment Research Council, suggest that "sustainable development assessments" be attempted and experimented with. (Jacobs and Sadler, 1990, p. 172)

The proposed Canadian Environmental Assessment Act would institute the practice of "follow-up" and "monitoring" of major projects with a view to verifying the accuracy of impact prediction and determining the effectiveness and appropriateness of mitigative measures. The Act, however, makes no reference to either the need or the practice of long-term management in the context of environmental assessment.

In summary, the potential transition, expansion or transformation of environmental assessment from a predictive tool to a management tool remains at the theoretical level and has not yet become part of EA practice. As noted earlier, the Great Whale review is attempting to operationalize the long-term management component of environmental assessment, but without a well-developed theoretical framework to serve as guidance. The principal argument of this report, as suggested earlier, is that a conceptual leap is in order for environmental assessment. Much of the recent literature dealing with environmental assessment makes this inference without stating it directly. In calls for “tiering”, “follow-up”, “monitoring”, "post-project audit and review” and other neglected needs, it is argued, are implicit assertions of the need for a “long-term management” role for environmental assessment - a role given increasing impetus by the emergence of sustainable development as a policy framework.

2. Environmental Assessment and Long-term Management: Towards New Theories and Measures

In the preceding section it was argued that the most critical deficiency of current environmental theory and practice is the lack of a long-term management role and capability. This deficiency, it is argued, has constrained the development of environmental

assessment. The full potential of environmental assessment (and a better understanding of its limits) cannot be achieved until this deficiency is addressed.

In this section some means of bringing about the transition of environmental assessment from reactive and predictive tool to long-term management system are discussed. The potential contributions of various environmental assessment and management frameworks in this regard are discussed. First, however, some general principles for long-term management are listed and discussed briefly.

Principles for long-term environmental management

The following principles are derived from various sources, including environmental management and sustainable development literature, planning literature, and ecological theory. Many of the principles remain preliminary, and are thus described briefly. Collectively, they are intended to constitute a rough framework for long-term management, and should be considered in relation to the established theories and emerging frameworks and strategies that are described later in this Section.

- Environmental assessment practitioners should be prepared to operate on various shorter and longer term time frames simultaneously. There is thus a need for non-linear thinking, a willingness to reconceptualize the temporal nature of the development process in terms of its “beginnings” and “endings”, and

a predisposition to assess the full life cycle of development activity and therefore extend planning horizons.

- The terms and conditions tied to project approvals should be viewed as equally, if not more important than the approval itself. Project approval should no longer be thought of as a "gate", which, passed through once, need never be revisited. The role of environmental assessors and decision-makers is thus not to be "gatekeepers", but managers. Phased approvals should be contemplated.

- The notion of "drift" as described by Jane Jacobs (Cities and the Wealth of Nations) is a valuable concept. According to Jacobs, the actual results of development are never entirely predictable. Rather, development entails "drift", or unintended results, digressions, costs and benefits (i.e. such as surprising technological breakthroughs) Societies can thus never be quite sure what development activities will give rise to. In the context of environmental assessment and management, it is useful to keep this in mind.

- The predictive limits of environmental assessment need to be explicitly recognized. Any pretense that environmental assessment is a "rational/comprehensive" exercise should be discouraged. This recognition will place more value on management, and less emphasis on assessment.

- In considering and managing impacts, the relationship between natural and cultural periodicity (Mulvihill and Jacobs, 1991) should be considered carefully. This is an integral aspect of sustainable development and another way of thinking about the integration of economic and ecological concerns.

- Environmental assessment and management systems must be adaptive. (Holling, 1978; Mulvihill and Keith, 1989)

- The inherent fluidness of projects must be recognized at the assessment stage. Project design variants are seldom "final". The current Great Whale review has shown how difficult it can be to agree on a project definition. This supports the need for long-term management of projects, since in this light assessment becomes an ongoing function.

- Long-term management, or management over time, seems largely a question of identifying which assessment/management processes are needed at given times in a project life cycle; determining what the configuration of these processes should be; developing tools for their integration; and building responsiveness and the capacity for transition into the overall system. It is less a question of one process, and more a question of several horizontal processes.

- The process(es) must be linked to day-to-day decision making.

- The full temporal and spatial extension of impacts needs to be considered in assessment and dealt with through management.

- "Cross-sectoral partnerships" are increasingly recognized as an important strategy for sustainable development. This approach, along with cross-disciplinary research, should be incorporated in environmental assessment and management systems.

- Holling's (1978, 1981) notion of "safe-fail" remains an important principle. According to this principle, development planning should proceed on the assumption that unanticipated and undesirable effects will occur, and strategies should be developed beforehand to minimize the problems arising from such effects. This is in direct contrast to the more traditional "fail-safe" philosophy of comprehensive planning.

- Concerns for the efficiency (i.e. the cost) of environmental assessment processes should be taken into account, but should provide no basis for not incorporating a long-term management component. In this respect, the "true costs" of development, including costs associated with fixing problems which arise from poor planning, must be considered.

Finally, the principle of the reversibility of impacts is of central importance. It is not always clear whether or not development proposals entail significant potential impacts. Substantial levels of uncertainty regarding impacts often characterize environmental

assessment processes. According to this proposed principle, the level of the reversibility of the impacts should be at least equal to the level of uncertainty surrounding the impacts. Put another way, "minimizing irreversibility" may also be thought of as "preserving possibility", i.e. options. In cases where impacts are clearly irreversible, the distribution of impacts should be determined and managed accordingly.

In conclusion, this preliminary set of principles for long-term management needs to be incorporated into an eventual institutional approach. The potential of several theories, strategies and frameworks which deal directly or indirectly with the challenge of long-term management in the context of environmental assessment are discussed next.

Theories, Strategies and Frameworks for Incorporating Long-Term Management into Environmental Assessment

Within environmental assessment and management literature, several approaches which have the potential to incorporate long-term management into EA have appeared. Some have been around for years, while others are still in the formative stage.

Adaptive Environmental Assessment and Management

The Adaptive Environmental Assessment and Management (AEAM) strategy was introduced by Holling in 1978, and has been elaborated by Holling and others since that time. To date, the fate of AEAM has been a curious one. It has been acknowledged by virtually every

environmental theorist and practitioner, and has been rejected by few. Nevertheless, the researcher is hard-pressed to find many examples of actual application of AEAM. In one case, a team of researchers, hunters and resource managers in the Belcher Islands have proposed to apply the principles of adaptive management. More often than they have been explicitly applied, however, some of the principles of of AEAM have crept into "standard" environmental assessment methodologies. It is probably accurate to say that the full intent of AEAM as proposed by Holling has never been applied.

According to Jones and Greig (1985, p. 21), AEAM is "a collection of concepts and approaches whose common theme is the recognition that uncertainty is the dominant component of most environmental issues." As noted earlier, Holling is a proponent of procedural adaptiveness and the "management of surprise"; he stresses that "avoiding the foreclosure of options" should be a guiding principle. Jones and Greig also noted that AEAM provides "a set of tools to facilitate problem identification, communication and explicit impact prediction." (p. 41) In essence, AEAM is a philosophy of how to deal with uncertainty. To the extent that it is an identifiable system, it involves interactive workshops, impact modelling and other techniques.

Long-term management appears to be an explicit goal of AEAM. Marshall makes this point, albeit indirectly, in discussing "impact management":

"EIA should be an interactive process involving a feedback loop from initial project design, predictions, auditing of prediction and impact management to subsequent changes in project design. If it were to evolve in this direction, future EIA's would be better equipped to deal with uncertainty, and actual impact could be more effectively mitigated and avoided through the application of EIA consisting of two major components; prediction and management." (Marshall, 1985, p. 18)

Marshall goes on to note that without the linkage between environmental assessment and project implementation, EA ceases to be an integral part of environmental management.

It seems clear that any initiative to promote the long-term management aspect of environmental assessment should consider the AEAM approach.

Ecological Framework for Environmental Impact Assessment

In 1983 Beanlands and Duinker reported on a series of workshops that sought to establish, as the title of their report suggests, "An Ecological Framework for Environmental Impact Assessment in Canada". The report makes a substantial theoretical contribution to the challenge of long-term management, although at the time the workshops were focussed primarily on the improvement of assessment techniques.

Beanlands and Duinker make distinctions among "boundaries" in environmental assessment; "boundary-setting", in this sense, refers to decisions regarding what the EA process should and should not try to accomplish given its resources, mandate and constraints. The four types of boundaries, they submitted, are "administrative boundaries,

or “time and space limitations imposed for political, social or economic reasons”; “project boundaries”, meaning “time and space scales over which the project extends”; “ecological boundaries”, or “time and space scales over which natural systems function”‘; and, finally, “technical boundaries”, meaning “the limitations imposed by the unpredictability of natural systems and by our limited capabilities to measure ecological change.” (Beanlands and Duinker, 1983,
p. 93) They went on to describe a case study environmental assessment in which, “there was little evidence of any ecological rationale in the temporal aspects of impact predictions.”

Besides their boundary-setting framework, Beanlands and Duinker contributed to the general problem area of long-term environmental management by discussing, among other things, the difficulties of impact prediction, the role of uncertainty and the nature of ecosystems.. “An Ecological Framework” remains a useful reference for the study of long-term management.

Cumulative Effects Assessment

Cumulative Effects Assessment, or CEA, has been the subject of a growing number of research initiatives in environmental assessment. Theories have been postulated regarding the nature of cumulative effects (additive vs. synergistic); their spatial and temporal extension; the ability of researchers to predict them; and the development of methodologies to do so. In the Great Whale review, for example, the proponent has been asked to report on the

cumulative effects of hydroelectric projects, and "cumulative" has been defined broadly in terms of space and time. Notwithstanding this tall order, much research remains to be done in the area of CEA, and relatively little practical experience has been gained to date. Research into CEA is bound to shed light on the challenge of long-term management, since the problem of impacts extending over various time scales is common to both studies.

Sonntag et al make a direct link between CEA, monitoring and long-term management:

"CEA must be a continuous exercise over longer time intervals and wider areas than provided for by traditional EIA processes....To undertake such monitoring requires an overviewing group with a mandate to take a regional, longer-term perspective." (Sonntag et al, 1987, p. 29)

Davies expands on the challenge:

"Follow-up plans are an integral part of CEA, and should include:
- An examination of possible prevention, mitigation and compensation plans;
- An implementation plan for the project or activity;
- A program to manage any residual environmental effects. This should include a post-assessment monitoring program and post-assessment roles, responsibilities and procedures." (Davies, 1991, p. 10)

Davies makes a number of linkages with respect to the range of parallel and sequential processes needed to achieve a coherent and integrated environmental assessment and long-term management system. Her description of the tasks inherent in cumulative effects assessment shows that management over time is an integral part of CEA. In summary, the study and practice of CEA appear to hold

particular promise for the edification of long-term management, and vice-versa.

Integrated Resource Management

Integrated Resource Management (IRM), as described by Lang et al (1990) and others, has been advocated by many researchers and practitioners as a solution to the problem of fragmented resource management regimes. Alberta, for example, has had an operational IRM system for several years.

The Government of the Northwest Territories has discussed adopting **its own version of IRM,** and defines it as follows:

"Integrated resource management is the coordinated participation of a broad range of agencies, publics and other interests during the design and implementation of policies, programs or projects affecting land and water resources. The process is characterized by the sharing of values, information and advice among various interests." (GNWT, 1989)

IRM appears to have the potential to contribute to long-term management since it promotes integration, addresses both the design and implementation stages of development, is not project-specific, and is characterized by transparency and sharing of information.

Monitoring

Environmental monitoring, a neglected part of environmental assessment for many years, has been the subject of increasing discussion and research, and governments and proponents are gradually making commitments to it. Some major unresolved questions concern the specific relationships between assessment,

monitoring and action; the problem of what variables to monitor; how to conduct monitoring - i.e. what techniques to use; and who should conduct (and pay for) monitoring - i.e. the proponent or an independent organization. Despite these and other outstanding issues, monitoring is now broadly recognized as an integral part of effective environmental assessment.

Distinctions are made between "compliance" monitoring - making sure the proponent adheres to the terms of the project approval- and "effects" monitoring - actual monitoring of impacts. The latter is now the focus of most attention. Woodley (1991) advocates "integrated monitoring" in order to account for differences in spatial and temporal scales. He notes that ecosystems are "hierarchical" in form, and that "integrated monitoring" attempts to understand changes at ecosystem levels. Woodley notes that ecosystem responses may take several decades, but that most monitoring to date has taken place over limited spatial and temporal scales. Holling, he notes, has observed that most environmental monitoring has been conducted over a span of less than 1 year, and over areas of less than one square meter, even though, Holling argues, to reveal useful or definitive information such efforts would have to be conducted over a span of at least 200 years and over a minimum of 70,000 square kilometers.

Clearly, the theory and practice of effects monitoring require time to develop. In the meantime, they yield lessons for long-term management, particularly by providing a sense of the inherent

challenges of impact management. Long-term management to a large extent revolves around the question **of** what to do with information gained through monitoring. It thus appears that a conceptual leap is required among some researchers - they must begin to explore the specific institutional connections between monitoring and management. McNeely supports this need:

> "EA is almost invariably carried out too late, and ends too soon....EA needs to continue long after the project has been 'assessed'. Institutional mechanisms should be established for monitoring both environmental and socio-economic aspects of projects during their implementation phase, and to enforce necessary modifications to projects when they are diverging from the planned course." (McNeely, in Jacobs and Sadler, 1990, pp. 111-l 12)

In summary, monitoring must be a part of long-term management. In any case, monitoring will remain irrelevant, except as an indulgence of intellectual curiosity, until it fits into a such a management system.

Follow-Up, Audits and Evaluation

"Follow-up", "audits" and "evaluation" are also part of the language of environmental assessment and management. It will suffice to say here that these practices, like other components, require experience and conceptual development, and may constitute valuable parts of an environmental management regime. Sadler, in particular, has discussed the value of audits and evaluation in improving assessment and management practices by making them more responsive to impacts. "Follow-up" is included in the list of proposed improvements to the Federal Environmental Assessment Review

Process, although Bill C-78 is rather vague as to how it will be done, and rather silent as to how it fits into a management, rather than an assessment system.

Intergenerational Equity

Equity is recognized as an integral aspect of sustainable development. (Jacobs and Munro, 1987) "Equity" is taken to mean both "intra" and "inter" generational equity. Intergenerational equity is of particular significance to long-term management, since ethical decisions regarding the allocation of resources over multiple generations would be an obvious exercise in managing scarce resources over the long term. The burgeoning field of environmental economics promises to shed increasing light on the fundamental relationship between equity and resource management.

Norgaard (1992) has elaborated some of the key issues concerning intergenerational equity and sustainable development. He terms development "resource allocation", while projects are "vehicles for resource allocation". In this context, Norgaard argues, we should think in terms of multiple uses of projects:

"With reculturation and greater participation, projects are increasingly being designed to meet the minimum criteria of diverse parties rather than designed to meet a single efficiency criteria."

Norgaard explores the challenge of long-term management:

"Concern over the sustainability of development has accentuated the issue of development maintenance."..."Sustainable development requires vigilant day-to-day, appropriate interaction with the complexities of ecosystems. Unlike the progressive vision, development is not a process of figuring things out and setting them up correctly once and for all."

Furthermore, Norgaard terms this process: "...an intermittent, adaptive process of establishing institutions to assure sustainability." He concludes:

"Projects will be seen increasingly as having two components: an investment component which should provide a return on current savings and a transfer component designed to help meet intergenerational equity objectives. The distinction between these two components, however, will rarely be clear." (Norgaard, 1992, pp. 90-115)

The study of intergenerational equity will undoubtedly offer lessons for long-term management, since the two things are intimately related.

Summary

Although relatively little research has explicitly addressed the challenge of long-term environmental management, theories, strategies and frameworks such as those described above have dealt with it implicitly, and long-term management is emerging as a recognized aspect of sustainable development.

3. Long-Term Management in Canada's North: Some Initiatives

This concluding section briefly discusses three examples of initiatives in northern Canada in terms of their potential to advance the practice

of long-term environmental management. The examples - the Arctic Environmental Strategy and Action Plan; initiatives taken by the Government of the Northwest Territories; and the proposed Nunavut Impact Review Board - are chosen on the basis of their strategic diversity. It is likely that long-term environmental management may be pursued through a variety of institutional approaches, although, as argued earlier, environmental assessment seems to be a central process around which others converge.

Other case studies which could have been discussed include the environmental assessment and review of the Great Whale project; the Lancaster Sound Regional Plan; or Hydro-Quebec's Réseau de Surveillance Ecologique. Northern Canada is chosen as the case study region for a variety of reasons; the main reason is that the north is a dynamic setting in which new institutional approaches to environmental management are either proposed or in various stages of implementation. The author has found northern Canada to provide an interesting mix of contextual forces which together constitute a setting for experimentation in environmental management and which often yield models and lessons for the south.

The Arctic Environmental Strategy and Action Plan

A part of Canada's Green Plan, the Arctic Environmental Strategy and Action Plan (AESAP) was released in 1991. The AESAP is notable because it reflects policy shifts within the federal government and an explicit commitment to sustainable development. Indeed, the AESAP's ambitious goal is: "To preserve and enhance the integrity,

health, biodiversity, and productivity of our Arctic ecosystems for the benefit of present and future generations." The strategy/plan calls for, among other things, "comprehensive monitoring networks" for water and other resources; and "community resource management plans". (Environment Canada, 199 1)

Like the Green Plan, the AESAP is vague. It does not say how the comprehensive monitoring networks will work, what their institutional design will be, or how they will interact with related processes. With respect to how monitoring will interface with environmental assessment, the plan says only that FEAR0 or its successor will be the determinant.

The AESAP is potentially significant because it commits resources to monitoring; it provides the policy framework of sustainable development for planning, management and assessment processes; and it implicitly affirms the need for long-term management in the Arctic. It remains to be seen just how the AESAP will be implemented.

Government of the Northwest Territories Initiatives

In 1989 the Government of the Northwest Territories (GNWT) released two public discussion papers. The first of these, prepared by the GNWT's Interdepartmental Working Group on Sustainable Development, is entitled: "Balancing Conservation and Development". The second paper, prepared by the Department of Renewable

Resources, is entitled: “Proposed Environmental Assessment Review Process for the Government of the Northwest Territories”. Both papers are thoughtfully written, and reflect a growing internalization of sustainable development thinking.

“Balancing Development and Conservation” makes reference to what the GNWT considers principles for an appropriate “pace of development”. According to the GNWT, the Northwest Territories should:

- "Promote development schedules which take into account the need for adequate training of the resident labour force, environmental research and planning, and anticipated resource needs.”
- “Encourage a phased approach to project development to provide both industry and affected northern residents with beneficial periods of adaptation and adjustment.”
- “Encourage a pace of development for individual projects which is in keeping with the affected community’s or region’s capability to develop another resource once the project has closed down.”
- “Promote the early preparation of plans for project closure to ensure that sites disturbed by non-renewable resource development are reclaimed in a manner which produces sustainable benefits to northern residents, or that at least does not represent an ongoing net cost.”

The second discussion paper outlined an environmental assessment process for projects within the purview of the territorial government. The proposed process recognized the need for cumulative effects to be assessed; proposed a strong monitoring component; and described links between environmental assessment and a licensing/permitting system. The discussion paper, in fact, made the integrative links among environmental management processes a central part of its proposed process. Whereas earlier environmental assessment

processes in Canada had made such linkages an afterthought, or had ignored them altogether, the GNWT's paper explicitly recognized that the effectiveness of environmental or resource management regimes is compromised when their individual components are fragmented.

Both of the GNWT's initiatives show a sensitivity to the nature and requirements of long-term environmental management.

The proposed Nunavut Impact Review Board

The recent Final Agreement signed between the aboriginal claimants of the Eastern and Central Arctic (The Tungavik Federation of Nunavut) and the Government of Canada provides for the establishment of a multi-faceted resource management system. In order not to repeat mistakes made in previous land claim settlements, the negotiators of the TFN Final Agreement paid considerable attention to how the pieces of the environmental regime would fit together. The components include a Planning Commission, a Planning Policy Committee, a Wildlife Management Board, a Territories-wide Surface Rights Tribunal, a Water Board and an Impact Review Board. The latter entity, called NIRB, or the Nunavut Impact Review Board, will be charged with conducting environmental assessment of projects in the TFN settlement area. (Fenge, *1990)*

Along with self-government, cultural programmes and economic development, environmental protection was an explicit goal of the TFN Final Agreement. The interrelationship of social, cultural,

political, economic and environmental goals was considered throughout the negotiation process by the TFN. The result is that environment is not an externality in this new regime, and sustainable development is an overriding policy framework. Through a system of land ownership, protected natural areas and environmental rights, the spirit of sustainable development is reflected throughout the agreement.

NIRB's purpose is not only to review impacts, but to "protect the ecosystemic integrity of the Nunavut Settlement Area". As Fenge discusses, NIRB's overarching purpose was clear to its claimants and negotiators:

> "Inuit have sought to...put in place a more forward looking, anticipatory, planned and integrated approach to deciding how, when, where, and by whom natural resources should be used."

With respect to the allocation of sub-surface development rights (still controlled by the Federal Government), Fenge makes this observation:

> "The Nunavut Impact Review Board. . ..will have the authority to issue a project certificate setting out the terms and conditions under which the project may proceed. These terms and conditions are then to be incorporated in permits and licences issued by sub-surface resource management agencies. . . ..While not regulating such development, the Nunavut Planning Commission, NIRB and other institutions could indirectly influence the scale, pace and timing of oil, gas and mineral development." (Fenge, 1990)

Analysis

Taken together, these three brief case studies show how the principle and practice of long-term environmental management are being built into the institutional design of Canada's rapidly changing north. In

the case of the Arctic Environmental Strategy, the initiatives are tentative and somewhat vague. The Government of the Northwest Territories demonstrates a steady incrementalist approach to rethinking resource management by injecting new ideas and by addressing the new imperatives brought about through wide endorsement of sustainable development. For their part, the Tungavik Federation of Nunavut are attempting to rethink and redesign resource management along lines that show an overarching concern for the long term viability of natural and cultural systems.

The Tungavik Federation of Nunavut case in particular emphasizes three main points that have been discussed and argued in this paper:

- Environmental assessment as currently practiced does not in and of itself provide an adequate pathway to sustainable development.

- A resource management system is not very useful without guiding principles, theoretical underpinnings and a policy framework.

- The interrelationships among components of a coherent environmental management system should not be left to chance. Linkages are needed and should be carefully planned and built.

Conclusion

This report has explored the potential for environmental assessment systems and processes to be expanded to include a long term management role. It is concluded that despite its historical shortcomings and inherent limitations, EA remains a promising instrument that may be expanded and re-deployed. Priority in research and practice should be given to exploring and incorporating long term management principles, features and capabilities. The preliminary principles and brief identification and analysis of frameworks in this report should be useful in this regard. Much remains to be done in this relatively uncharted area, although some lessons from the experience with EA in the Canadian north should not be ignored.

Bibliography

Beanlands, G. and Duinker, P., 1983. An Ecological Framework for Environmental Impact Assessment in Canada. Hull: Federal Environmental Assessment Review Office

Berkes, F. 1988. "The Intrinsic Difficulty of Predicting Impacts: Lessons from the James Bay Hydro Project", Environmental Impact Assessment Review, 8 (3): 201-220

Canadian Environmental Assessment Research Council, 1988. EvaluatingEnvironmental Impact Assessment: An Action Prospectus

Canadian Environmental Assessment Research Council and the U.S. National Research Council Board on Basic Biology, 1986. Cumulative Environmental Effects: A Binational Perspective

Davies, K., 1991. Cumulative Environmental Effects: A Co pendium (First Draft) Report prepared for the Federal Environment: Assessment Review Office

Department of Indian and Northern Affairs, Canada, 1988. "Development Impact Provisions of an Agreement in Principle: Screening and Review of Project Proposals and Applications", The Tungavik Federation of Nunavut Comprehensive Claim Agreement in Principle.

Fenge, T., 1990. "Toward Environmentally Sustainable Economic Development in the Canadian Arctic: The Potential Contribution of the Inuit Land Claim". Unpublished paper.

Gardner, J., 1987. Initial Review of Environmental Assessment and Related Processes in Support of Sustainable Development Report to the Canadian Environmental Assessment Research Council

Government of Canada, 1991. The Arctic Environmental Strategy and Action Plan

Government of the Northwest Territories, 1989. "Balancing Conservation and Development". Draft public discussion paper, Interdepartmental working group on sustainable development.

Government of the Northwest Territories, 1989. "Proposed Environmental Assessment and Review Process for the Government of the Northwest Territories", Public discussion paper.

Holling, C.S. et al, 1978. Adaptive Environmental Assessment and Management London: Wiley

International Institute for Applied Systems Analysis, 1979. Expect the Unexpected: An Adaptive Approach to Environmental Management Austria: IIASA

Jacobs, P. and Sadler, B., 1990. Sustainable Development and Environmental Assessment: Perspectives on Planning for A Common Future Hull: Canadian Environmental Assessment Research Council

Jacobs, P., P.R. Mulvihill and B. Sadler, 1993. "Environmental Assessment: Current Challenges and Future Directions". Paper presented to the Canadian Institute of Resources Law conference: Law and Process in Environmental Management. May 13, 1993, University of Ottawa.

Lang, R. (ed) 1990. Integrated Approaches to Resource Planning and Management

Leblanc, P.J. and Manitowabi, R. 1991. "Introducing the Concept of Follow Up in the Canadian Environmental Assessment Act (Bill C-78)". Paper presented for the Federal Environmental Assessment Review Office at the Post-Hoc Environmental Management Workshop, University of Waterloo.

Lee, N., 1980. "The Future Development of Environmental Impact Assessment". Environmental Impact Assessment Review 14:71-90

Maclaren and Whitney (eds). 1985. New Directions in Environmental Impact Assessment in Canada Toronto: Methuen

Marshall, D. et al, 1985. Environmental Management and Impact Assessment: Some Lessons and Guidance from Canadian and International Experience Occasional Paper, Federal Environmental Assessment and Review Office

Mulvihill, P.R. and Jacobs, P. 1991. "Towards New South/North Development Strategies in Canada", Alternatives, Vol 18, No 2, 34-39

Mulvihill, P.R. and Keith, R.F., 1989. "Institutional Requirements for Adaptive EIA: The Kativik Environmental Quality Commission", Environmental Impact Assessment Review, Vol 9, No 4, 399-412

Munro, D. et al, 1986. Learning from experience: a state-of-the-art review and evaluation of environmental impact assessment audits Ottawa: Environment Canada

Norgaard, R.B., 1992. "Sustainability as Intergenerational Equity: Economic Theory and Environmental Planning". in Environmental Impact Assessment Review, May-June, 12:85

Peterson, E.B. et al, 1987. Cumulative Effects Assessment in Canada: An Agenda for Action and Research Hull: Canadian Environmental Assessment Research Council

Richardson, N., 1989. Land Use Planning and Sustainable Development in Canada Ottawa: Canadian Environmental Advisory Committee

Sadler, B., (ED) 1987. Audit and Evaluation in Environmental Assessment and Management: Canadian and International Experience. Vol 2. Ottawa

Sadler, B. 1990. An Evaluation of the Beaufort Sea Environmental Assessment Panel Review Hull: Federal Environmental Assessment and Review Office

Sonntag, N.C. et al, 1987. Cumulative Effects Assessment: A Context for Further Research and Development Hull: Canadian Environmental Assessment Research Council

Smith, E. (ed) 1990. Sustainable Development Through Northern Conservation Strategies The Banff Centre: Univ. of Calgary Press

Woodley, S. 1991. "Monitoring for Ecosystem Integrity in National Parks", Paper presented at the Heritage Resources Centre Workshop on Post-Hoc Environmental Management, University of Waterloo