

USE AND ABUSE OF ADAPTIVE MANAGEMENT IN ENVIRONMENTAL ASSESSMENT LAW AND PRACTICE: A CANADIAN EXAMPLE AND GENERAL LESSONS

ARLENE J. KWASNIAK

*University of Calgary, Faculty of Law
4312 MFH, 2500 University Drive NW, Calgary
Alberta, T3A1L7, Canada
akwasnia@ucalgary.ca*

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Adaptive management theory recognises that we cannot make foolproof predictions of environmental impacts of human interventions into complex ecosystems. It mandates that environmental managers retain the ability to respond to change and inaccurate predictions. The Canadian Environmental Assessment Act (CEAA) authorises government to implement adaptive management into project follow-up. A key Canadian court decision has interpreted this to mean that adaptive management enables projects to proceed when mitigation measures are uncertain, that could be used in tempering the significance of impacts, and that it offsets the impact of the precautionary principle. Taking a legal perspective, the paper discusses how adaptive management may benefit environmental assessment, how the CEAA uses it, how a court has misinterpreted its role in the CEAA, and how it relates to the precautionary principle. In closing the paper sets out general lessons from the Canadian experience for the use of adaptive management in environmental assessment generally.

Keywords: Adaptive management; environmental assessment; Canadian Environmental Assessment Act; mitigation; follow-up; precautionary principle.

Introduction

The notion of “adaptive management” was introduced into the Canadian Environmental Assessment Act¹ (“CEAA”) through 2003 amendments.² Subsection 38(5) of the amended Act states:

The results of follow-up programs may be used for implementing adaptive management measures or for improving the quality of future environmental assessments.

The Act defines a “follow-up program” to mean a programme for verifying the accuracy of an environmental assessment of a project, and determining the effectiveness of measures taken to mitigate the adverse environmental effects of a project.³

The Canadian Environmental Assessment Agency (the “Agency”) defines “adaptive management” in its Operational Policy Statement — Adaptive Management Measures under the Canadian Environmental Assessment Act.⁴ The Agency administers much of the CEAA environmental assessment process, promotes federal and federal/provincial/territorial cooperation in environmental assessment processes, and develops policy relevant to federal environmental assessment.⁵ The Agency characterises “adaptive management” as:

In general, adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes. Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project. Planning for adaptive management should commence as early as possible in the EA process. While specific adaptive management measures may not be identifiable at that point, a strategy or plan should be developed to provide context on when, how and where adaptive management may be used. Decisions to adopt specific adaptive management measures can be identified later during the project life-cycle

¹S.C. 1992, c. C-37 (CEAA).

²Canadian Environmental Assessment Amendment Act, S.C. 2003, c. 9.

³CEAA, *supra* note 1, s. 2(1).

⁴Canadian Environmental Assessment Agency (2009), (“Operational Policy Statement”). The Operational Policy Statement is meant to provide best practices guidance on the use of adaptive management under the CEAA.

⁵CEAA, *supra* note 1, s. 61.

as a result of the analysis of data generated by a rigorously implemented follow-up or monitoring programme.⁶

Since added to the Act, the notion of adaptive management has featured in CEAA reviews and court decisions. Unfortunately, the term has not been consistently used or characterized, and its use does not always reflect adaptive management in its classic and acceptable form.

This paper argues that although adaptive management can play a positive role in environmental assessment and subsequent environmental management, the concept must be correctly and appropriately applied. In particular, it must not be used as a “substitute for committing to specific mitigation measures.”⁷ So it cannot be used to cover a situation where a proponent is not sure how to mitigate a negative environmental impact, but commits to finding the technology or science in the future, if a problem arises. As well, it must not be used to attempt to reduce uncertainty with respect to likely significant adverse environmental effects. Accordingly, if it is uncertain whether a significant adverse environmental effect from a project will occur, adaptive management cannot be asserted to, in effect, say, if there is a significant impact, we will adapt to deal with it. As well, it cannot be used to attempt to reduce uncertainty regarding proposed mitigation measures.⁸ Finally it should not be used as to “offset” to the precautionary principle, which requires that when faced with uncertainty regulators should act in precautionary manner. Adaptive management and the precautionary principle play distinct roles in Canadian federal environmental assessment.

The second part of this paper provides a short history of adaptive management and its role in environmental assessment and environmental management. The third part focuses on the legislated role of adaptive management in the Canadian federal environmental assessment process. The part argues that the Agency’s characterisation of “adaptive management” although partly reflective of classic adaptive management, it is limited as it does not fully accommodate adaptive management as envisioned and preferred by its early proponents Holling and Walters, notably as set out in Holling’s (editor) 1978 publication — *Adaptive Environmental Assessment and Management*, and Walters and Holling in their 1996 article “Large-Scale Management Experiments and Learning by Doing.”⁹ The part also argues that the CEAA is limited in that it does not accommodate the full potential for using adaptive management in the environmental assessment

⁶Operational Policy Statement, *supra* note 4 at 2.

⁷*Ibid.*, at 4.

⁸All three examples are *ibid.*

⁹*Ecology*, 71(6), 2060–2068.

process. The fourth part discusses comments made by the Court in *Pembina Institute for Appropriate Development, et al v. Attorney General of Canada and Imperial Oil Resources Ventures Limited*¹⁰ decision (the “Kearl Mines case”). The paper argues that some of the Court’s comments on the role of adaptive management in federal environmental assessment processes are incorrect and reflect an abuse of adaptive management methods. The fifth part discusses the role of the precautionary principle in the CEAA as this concept sometimes is confused with adaptive management. The sixth part provides a summary and conclusion, a path forward for the use of adaptive management in Canadian federal environmental assessment, and general lessons that may be gleaned from the Canadian experience. These lessons hopefully will shed light on the proper use of adaptive management in environmental assessment processes, and help environmental assessment practitioners to identify abuse.

About Adaptive Management

Holling, adaptive management, and uncertainty

The Canadian scientist/ecologist Holling was an early proponent of adaptive management.¹¹ Holling and his colleagues developed and promoted adaptive management as an alternative management and policy approach to address the surprises of the world of dynamic, complex ecosystems systems, interacting with each other, and responding to human interventions.¹² As legal academic Ruhl put it “Holling and his fellow researchers described conventional environmental management methods as being inconsistent with the “nature as flux” model of ecosystems as complex adaptive systems. ... Whereas “front end” regulatory instruments lock in positions through fixed rules and standards, ... an adaptive management framework is more experimentalist, relying on monitoring-adjustment “loops” of goal determination, performance standard setting, outcome monitoring, and standard recalibration.”¹³ Although science strives to better comprehend the effects of human interventions into and on complex, dynamic systems, some uncertainty regarding the impacts of human interventions is inevitable. This inevitable, surprise, uncertainty has consequences for environmental assessment. Environmental assessment is a

¹⁰*Pembina Institute for Appropriate Development v. Canada (Attorney General)*, 2008 FC 302 (the Kearl Mines case).

¹¹Holling (ed.) (1978), *supra* note 9.

¹²See also Walker and Salt (2006), for discussion of Holling and his colleagues influence on ecological thinking, and appropriate management responses in light of complex ecological systems.

¹³Ruhl (2004).

process designed to identify environmental impacts of proposed human interventions into and on the environment. If a proposed project and the receiving environment are simple enough, there may be no important remnant uncertainty in that adverse environmental impacts may be accurately predicted, and mitigation measures imposed will, in fact, mitigate the impacts. However the more complex the project, more complex and dynamic the receiving environments, more complex the relationships among the project, other human interventions, and the receiving environments, despite our best science and predictions regarding environmental impacts and successful mitigation, we could be proven wrong.

“Uncertainty” in this context does not mean, for example, that it is uncertain at the time an environmental assessment is conducted whether a given mitigation technique will actually mitigate adverse environmental impacts. “Uncertainty” rather relates to the acknowledgement that no matter how much scientific evidence and other information to conclude, for example, that a mitigation technique will successfully mitigate adverse effects, there are unknowns owing to the complexities of ecosystems and our inability to completely predict future events. These unknowns could prove that our predictions about mitigation success were incorrect. A publication by the Ministry of Forest Research Programmes (British Columbia) summarises the major uncertainties that drive adaptive management as follows¹⁴:

- Natural environmental variability (e.g., weather, fire, earthquakes, avalanches, volcanoes, stream flows, genetic composition of species, animal movements);
- Human impacts on the environment through global climate change, new technology, and the growing population;
- Lack of knowledge about most aspects of the ecosystems being managed; and
- Variations in social and political goals expressed as varying budgets, shifting policy directions, and changing demands for commodities, services, and aesthetic values

These uncertainties may occur despite our highest degree of certainty regarding the predicted impacts of a proposed project and our best efforts to anticipate future scenarios. It is the recognition that we are not seers and cannot predict everything, that unanticipated social changes and development may cause unknown cumulative effects, that ecological systems are extremely complex, and that any one or a combination of these factors may result in surprises. This paper sometimes calls such uncertainties “highly unpredictable uncertainties.”

¹⁴From Nyberg (1998).

Highly unpredictable uncertainties are what remain after we rely on our best science and other relevant information to ascertain certainty. For example, at Time T (a given time) on the basis of our best science and other relevant information we reasonably may predict as certain that if a specific amount of a chemical X at a particular dilution is discharged into a given water body, it will not cause any significant environmental impact, even taking into account actual and likely cumulative effects from other discharges into and activities relating to the water body. Although there may be certainty, it still is possible that something could happen in the future (Time $T + 1$) that will render this finding of no significant impact of chemical X to be in error. For example, assume that in the future, at Time $T + 1$, a new chemical Y is developed that interacts with X such that together X and Y cause a significant environmental impact to the water body. Further assume that at Time T there is no way of knowing that chemical Y will be developed. Adaptive management imposed at the time of approval of the discharge of chemical X into the water body could make it possible for the regulator to require the proponent to alter environmental management plans to avoid or redress the significant environmental impact.

Treating decisions as experimental hypotheses

Adaptive management provides approaches for environmental managers and policy makers to plan for, reduce, and respond to highly unpredictable uncertainties. One approach is to treat decisions made in relation to proposed projects as experimental hypotheses.¹⁵ Highly unpredictable uncertainties are reduced by, during the planning stage of a project, stakeholders developing scenarios that posit a variety of potential though unlikely future impacts, and developing alternate environmental management actions in the event that a scenario would transpire. Such hypotheses are to be “tested and reevaluated as additional information becomes available.”¹⁶ In identifying and selecting among alternatives, key considerations will include project design and adaptability. Monitoring and follow up may require modifications of management approach.

Modifying regulatory responses

Implementing adaptive management may reveal that our predictions regarding the environmental impacts of a project, or the anticipated success of a mitigation procedure, were inaccurate. What can be done such a circumstance? Ideally, the

¹⁵Benidickson *et al.* (2005).

¹⁶*Ibid.*

environmental management regarding the project will be modified to avoid continued adverse environmental impacts and to remedy the situation. However, this cannot be legally required unless the government has the authority to require the proponent, and others contributing to the situation, to make the necessary changes. This may be difficult unless one or the other or both of two situations exist. One is that the applicable legislation authorises the regulator to require changes in environmental management. The other is that the authorisations that government issued to enable the project to proceed are flexible enough to require the proponent, and other contributors, to amend approval conditions in such circumstances.

Contributing to future decisions

Holling states that the heart of adaptive management is that it is “an interactive process using techniques that not only reduce uncertainty but benefit from it. The goal is to develop more resilient policies.”¹⁷ The idea is that knowledge acquired from testing hypotheses, monitoring environmental impacts, and acknowledging and addressing inaccurate predictions, will feed back into the policy making process and will lead to better, and more accurate, decision making in the future.

Active, passive, and evolutionary (trial and error) adaptive approaches to environmental management

In the last 40 years “adaptive management” has been characterised in a myriad of ways.¹⁸ Walters and Holling provide a useful tool to understand different approaches to adaptive environmental management¹⁹ They distinguish three adaptive management approaches: active adaptive management, passive adaptive management, and evolutionary or “trial and error” approaches.²⁰

Active adaptive management is the most comprehensive approach. Active adaptive management begins with uncertainty regarding which environmental management activities will best meet management objectives. With active adaptive management managers select a range of alternative models to test to determine how to best achieve environmental management objectives. Each model is tested, monitored, evaluated, and revised as appropriate. In the end managers choose the

¹⁷Holling (ed.), (1978) at 9.

¹⁸In “Adaptive management frameworks for natural resource management at the landscape scale: implications and applications for sediment resources” (*J Soils Sediments*, 9, 578–593, Table 2) Owens (2009) identifies 17 definitions of adaptive management from the literature.

¹⁹*Supra* note 9.

²⁰Walters first set out the three approaches in his 1986 publication *Adaptive Management of Renewable Resources*.

model or models that are correct in that they will achieve management objectives, bearing in mind that future monitoring and unforeseen uncertainties may require modification of the chosen management actions²¹ For example, suppose that a fisheries management objective is to increase declining freshwater fish stocks in a river reach. Alternative response models might include varying harvests, or hatchery rates,²² limiting effluents from local industries, limiting agricultural pesticide and fertiliser runoff, and increasing flows. After testing these various models (singly or in combination) the one (or ones) with the best results are chosen as the correct policy choices. Again, the ideal project model will be designed to be adaptable in case predictions prove to be in error.

With passive adaptive management a single response model based on historical data to an environmental management issue/problem is assumed to be correct and is chosen and implemented. Like active adaptive management, passive adaptive management is monitored, evaluated, and revised as appropriate.

An “evolutionary” or “trial and error,” adaptive approach to environmental management is one in which “early [management] choices are essentially haphazard, while later choices are made from a subset that gives better results.”²³ Evolutionary or “trial and error” approaches, although adaptive approaches are not adaptive management. They normally would not involve any or much hypothesis testing, and may concern acting in the face of ordinary uncertainty, and not what this paper has called highly unpredictable uncertainties.

Of the two approaches that qualify as adaptive management Walters and Holling point out that most of the literature discusses passive approach and seem to assume that a passive approach is the best.²⁴ The authors, however, point out two fundamental shortcomings of passive adaptive management. First using the approach is likely to lead to confounding “management and environmental effects.”²⁵ Their example is a fishery with a 50+ year monitoring history where there still are debates about the “relative importance of fishing and environmental factors in driving population declines and cycles.”²⁶ They also point out that using a passive approach may limit the opportunity to improve environmental performance if both the correct and incorrect model predict the same response pattern and the policy choice was to implement the wrong model.

²¹ Walters and Holling, *supra* note 9 at 2061; Murray and Nelitz (2008).

²² Example from Walters and Holling, *supra* note 10 at 2061.

²³ *Ibid.*, at 2060.

²⁴ *Ibid.*, at 2061.

²⁵ *Ibid.*

²⁶ *Ibid.* Walters and Holling refer to Walters and Collie (1988).

An instructive way of looking at active and passive adaptive management is on a continuum ranging from pure research/learning to pure implementation/management/doing. The focus of passive adaptive management is on the management outcome end of the spectrum and not on learning, though learning may be a value result. A management plan is adopted based on historical data and experience and then monitored and adjusted as necessary to achieve better management. By contrast, active adaptive management falls closer to the learning end of the spectrum. Its focus is to conduct experiments to enable people to learn about complex systems and to test alternative management responses to ascertain the best policy and management response.²⁷

Environmental assessment and adaptive management

A cornerstone of sustainable development is environmental assessment. Through environmental assessment regulators obtain information to enable them to identify and assess the environmental, social, and economic consequences of projects and to assist them in determining whether they should be approved, and if so, under what conditions.

The particular steps in an environmental assessment process in a given jurisdiction depend upon the legislation authorising environmental assessments, and on the policies and practices of the agency overseeing environmental assessment processes. That said, a project environmental assessment typically includes a number of the following steps or stages²⁸:

- (1) Project planning²⁹
- (2) Project proposal

²⁷ Allan and Jacobson (2009).

²⁸ The key steps to environmental assessment have been identified in various ways over the decades. An early articulation is that of Beanlands (1983). His steps are: First, understand the receiving environment. Second, predict the proposed activity's impacts on and interactions with the receiving environment. Third, after policy decisions with respect to the activity are made, the activity proceeds. Fourth, monitor the activity to determine the accuracy of predictions. The list set out in this paper includes Beanlands steps as well as numerous other process and substantive steps commonly associated with project environmental assessment.

²⁹ Ideally the environmental assessment commences at the project planning stage, though in practice, often it commences at a fully planned project proposal stage. The CEAA, for example, requires that the federal authority overseeing an environmental assessment *ensures* that the environmental assessment is conducted "...as early as is practicable in the planning stages of the project and before irrevocable decisions are made". CEAA, *supra* note 1 s. 5(2)(b)(i). For a U.S. perspective see Goldberg (2003).

- (3) Determination of:
 - (a) the necessity for an environmental assessment
 - (b) level of intensity or comprehensiveness of environmental assessment³⁰
 - (c) scope of project and scope of environmental assessment
 - (d) terms of reference for the environmental assessment
 - (e) public and stakeholder participation parameters
- (4) Carrying out the environmental assessment
- (5) Overseeing agency determination of the adequacy of the environmental assessment report and modification as appropriate
- (6) Determination of whether the project will be approved, and if so, under what conditions including mitigation measures, monitoring, and follow up.
- (7) Monitoring the project to ascertain the accuracy of predictions regarding the projects impacts on the receiving environment
- (8) Implementing follow up measures where predictions prove inaccurate and follow up measures likely will address resulting environmental issues.

Adaptive management's role in environmental assessment typically is thought to be limited to a "trial and error" approach at worst (which is not true adaptive management) or passive adaptive management. For example, Thrower states "[p]reparation of an EIS [Environmental Impact Statement under the U.S. National Environmental Policy Act³¹] is a passive adaptive management technique where the agency selects the "best" option based on the best historical data then available, with the assumption that the model on which the predictions of the environmental response are based is correct."³²

Notwithstanding that environmental assessment typically is thought to adopt at best to sometimes incorporate passive adaptive management, in theory both active and passive adaptive management could be practiced, required, or at least be relevant, at a number of junctures in the environmental assessment process. Note that it is not suggested that adaptive management comprehensively be incorporated into all environmental assessment processes. With respect to each environmental assessment the overseeing agency must consider the appropriateness of using adaptive management. This will depend on many factors, including the complexity and dynamics of the receiving ecosystems, the interactions among the

³⁰In Canada, for example, there are four types of environmental assessment: screenings, comprehensive studies, mediations, and panel reviews. See discussion *circa* note 50.

³¹42 U.S.C. §§ 4321–4370.

³²Thrower (2006). Adaptive management and NEPA: How a nonequilibrium view of ecosystems mandates flexible regulation, *Ecological L.Q.*, 33, 871–895 at 884.

systems, the presence of and potential for cumulative effects, whether there is a repetitive problem in a simple system, and the likelihood that the project's impacts on the environment cannot be sufficiently addressed through "front end" command and control regulatory mechanisms, such that "back end" adaptive management may be appropriate.³³

Incorporating adaptive management at junctures in the environmental assessment process

There are many junctures in the environmental assessment process where in principle adaptive management could be incorporated. Here are some examples.

Project planning and design

At step #1, project planning, including consideration of alternative means for carrying out the project, a proponent as appropriate could carry out active adaptive management to ascertain the best way to design and plan a project by testing alternate models. The proponent could be required to ensure that the project models are designed to be adaptable in the face of highly unpredictable uncertainties. Adaptable design may include flexibility, modularity, safe-fail character, diversity of implementation options, and other features.³⁴ Chosen project design ideally would engage or facilitate resilient systems in the receiving environment.³⁵

³³It is not always appropriate that a resource manager require a project proponent to implement adaptive management into environmental management. Johnson (1999) points out that "... resource managers make a wide variety of management decisions in their jobs, ranging from instituting major policies with long time-frames, to short-term, repetitive decisions such as how many fish to stock or how many trees to cut." Johnson argues that some "replicated" decisions are easily and best dealt with by using tradition front end, command and control type regulation. However where an agency needs to address "complex problems in large, unique systems, and common problems in small, replicate systems "the use of adaptive management may prove beneficial."

³⁴The author thanks a referee of this paper for this point.

³⁵The referee *ibid* referred to Walker and Salt (2006). *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*, *supra* note 12. On pp. 145–148 Walker and Salt identify features of resilient world. Applying these features to a project design that recognises and facilitates resilience, the design would (a) promote and sustain diversity, (b) embrace and work with ecological variability, (c) facilitate the benefits of modularity (systems that are not over connected so that impacts to one system will not have widespread impacts (as in over-connected systems), (d) acknowledge and focus on slow variables so that the receiving system could absorb more disturbances and that there would be time to invoke new environmental management to address disturbances, (e) possess tight feedbacks so that thresholds could be detected before they are crossed, (f) reflect solid social capital and buy-in, (g) foster and encourage innovation, (h) be redundant, in that the design would possess a number of features to enable it to respond to a changing world, and (i) recognise unpriced ecosystem services.

Level of assessment

At step #3(b), level of assessment, the potential need to invoke adaptive management processes may be relevant in ascertaining the intensity or comprehensiveness of an environmental assessment. For example, if a project involves impacts on and interrelations with a dynamic and complex ecosystem, ideally the agency overseeing the assessment could require a higher, more intensive level of assessment than if the project will have impact on and interrelations with a fairly simple system, where the impacts and interrelations are well established and there are known to be effective regulatory measures. In the former case there may be more potential need for invoking adaptive management requirements than in the latter case. A more intense, comprehensive level of environmental assessment will give the agency overseeing the assessment a better basis on which to determine whether adaptive management will be required and if so, in what manner.

Scope of project and scope of assessment

In determining step #3(c), the scope of a project (is the project an oil sands mine or a draining of a wetland?; is it a major forestry operation or a river crossing?), and consequent scope of assessment (which impacts of the project as scoped will be considered?), adaptive management considerations are relevant. Ideally an environmental assessment process would require that in determining the scope of project the overseeing agency would consider the complexity of the receiving ecosystems and interactions among the systems, actual and potential cumulative effects and interactions with systems, and any potential uncertain impacts resulting from the project, including highly unpredictable uncertainties. The presence of at least a subset of these elements would alert the overseer of the potential for the need to invoke adaptive management. Given that environmental assessment is aimed at environmental sustainability, an ideal legislated environmental assessment process would be very careful about authorising or allowing a government authority to narrow the scope (downscope) of a project in a manner so that it lessens complexity or uncertainty to eliminate the potential for using adaptive management, and requiring adaptable project and mitigation design, and a follow up programme, where, in fact, traditional regulatory and management approaches would be insufficient to address project impacts.³⁶

³⁶That said, in practice proponents, and sometimes even agencies, may urge a narrower project scope to reduce uncertainty, and the need to require adaptive management in monitoring and follow-up. In Canada there are numerous examples of agencies downscoping projects, some which have lead to litigation. In the U.S. Ruhl (2004) points out that even in the limited areas where the U.S. Endangered Species Act of 1973 (16 U.S.C. §§ 1531–44) allows for adaptive management. administering agencies are hesitant to invoke adaptive management methods.

Setting terms of reference

Typical requirements for terms of reference include:

- providing a detailed description of the project and of the receiving environment;
- setting out baseline environmental, social, and cultural data and information;
- describing potential positive and negative effects of the proposed project;
- identifying uncertain effects and knowledge gaps;
- providing a cumulative effects assessment of the proposed project in conjunction with existing and likely projects;
- setting out detailed mitigation plans and alternative management strategies;

It is critical that the overseeing agency consider the potential use of or requirements for adaptive management when setting terms of reference at step #3(d). Adaptive management is aimed at recognising situations which may give rise to unanticipated project impacts and being prepared for inevitable surprises resulting from human intervention in dynamic complex systems. For example, if adaptive management is to be used then baseline data requirements include more than the usual inventory of potentially affected resources.³⁷ Requirements also would include information regarding the complex systems including an ecosystem characterisation setting out the key components and processes comprising an ecosystem and information on their inter-relationships and links.³⁸ As well, there will be additional terms of reference. One will be a requirement to produce an adaptive management plan. Another will be a requirement for the adoption of an integrated systems-approach to the assessment including social, economic, and cultural systems and system components. As well, other elements of the terms of reference will be adapted to conform to an adaptive management approach, for example, a cumulative effects assessment might include a consideration of various scenarios of interaction of the projects concerned and potential impacts and set out alternative management models to address impacts.

Determining public and stakeholder involvement

If adaptive management is or may be used in the environmental assessment process, monitoring, or follow-up, at step #3(e) the make up of the persons consulted and involved in the environmental assessment process may increase from those who would normally be consulted or involved in a situation where adaptive

³⁷Potentially affected resources would include identification and description of soils, rivers and water bodies, current water quality data, topographical and zoning maps, historic resources, census information, and like information. See, for example, Eccleston (2001).

³⁸Beanlands and Duinker (1983).

management is not anticipated. For example, experts and interested groups knowledgeable about ecosystem components or interactions might be consulted even if they are not affected by a proposed project. As well, participants should include those who recognise the limitations of command and control and other traditional management approaches, who see beyond reductionism and who believe that informing management is a key role for science.³⁹ Since adaptive management is a collaborative process that does not end with an environmental assessment the agency overseeing an environmental assessment must consider consulting those with concerns or interests regarding monitoring, models or management strategies, including those that may be invoked in case predictions regarding chosen model impacts and strategies are not correct.

Determining adequacy of environmental assessment report

At step #5 the overseeing agency has the opportunity to review the report and require amendments and modifications. These may include elements relevant to adaptive management such as the adequacy of an adaptive management plan.⁴⁰

Determination of whether the project will be approved, and if so, under what conditions including mitigation measures, monitoring, and follow up

At step #6, if the overseeing agency will require adaptive management measures it is important that monitoring design and follow up requirements are appropriate for adaptive management. For example, the focus of monitoring must be on indicators that are most likely to reveal trends related to maintaining the desired system structures and functions, paying special attention to where a system may be vulnerable to key thresholds.⁴¹ As well, the overseeing agency must be assured that the adaptive management plan be implementable. This requires flexible permits that can be opened up and modified, and timely feedback mechanisms so that issues revealed in monitoring can be responded to quickly.

Monitoring, follow up and implanting follow up measures

Monitoring in environmental assessment processes where adaptive management has not been invoked primarily is aimed at supporting compliance, though it could also provide information to be used in future assessments and to enhance

³⁹ Argent (2009).

⁴⁰For an interesting critique of an industry adaptive management plan in an environmental assessment context and discussion of what should be included in an adaptive management plan, see Murray and Nelitz (2008).

⁴¹I thank a referee of this paper for this point.

knowledge regarding the receiving environment.⁴² Where an adaptive management plan is required in the environmental assessment and subsequent regulatory processes, monitoring also serves to disclose situations where the environmental assessment predictions regarding mitigation of environmental impacts prove incorrect or incomplete. Then, the follow up plan will trigger the adaptive management plan for the proponent to respond.

Adaptive Management and the CEAA

About Canadian federal environmental assessment process

CEAA applies when a “federal authority” who is a “responsible authority” exercises certain powers or duties or performs certain functions in respect of a “project” or proposed “project.”⁴³ A “federal authority” means a Minister of the Crown, and certain government agencies, departments or bodies.⁴⁴ A “responsible authority” is the federal authority that oversees or administers an environmental assessment under the CEAA and assures that the statutory requirements are met.⁴⁵ “Project” means, in relation to a physical work, any “proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work.”⁴⁶ Section 5 of the CEAA sets out the main circumstances that will trigger the Act.⁴⁷ These are where a federal authority:

- (i) is the proponent of a project;
- (ii) lends or contributes financial assistance for a project to proceed;
- (iii) provides an interest on federal lands to enable a project to proceed, or
- (iv) issues a permit or other authorisation listed the Law List Regulations.

⁴²Hanna (ed.), (2009).

⁴³For an extensive review and critique of Canadian federal environmental assessment, see Doelle (2008).

⁴⁴CEAA, *supra* note 1, s. 2. The Act excludes some bodies from the definition.

⁴⁵*Ibid.*

⁴⁶*Ibid.*, s. 2; “Project” also means any physical activities set out in the Inclusion List Regulations, S.O.R./ 1994-637. These regulations set out undertakings that do not necessarily relate to a physical work yet but are subject to the Act. Examples include dumping specified substances, certain aviation activities and killing of migratory birds.

⁴⁷*Ibid.*, s.5. The CEAA may also apply in circumstances in which there is no s. 5 trigger. For example, the federal Environment Minister may order an environmental assessment in certain circumstances where a project may have significant adverse effects on another province, or where the project is carried out on federal lands or elsewhere in Canada and may have significant adverse environmental effects outside of federal lands or outside of Canada (s. 48) or where public concerns warrants an environmental assessment requirement (s. 28).

The Law List Regulations⁴⁸ referred to in paragraph (iv) set out provisions of federal acts or regulations that confer powers, duties or functions on federal authorities, the exercise or performance of which will require a prior environmental assessment. It also is noted that the Exclusion List Regulation excludes certain projects from the need for federal environmental assessment under the CEAA.⁴⁹ These are projects that the federal government has deemed to have minimal or insignificant environmental effects.

There are four types of federal assessment: screenings, comprehensive studies, mediations, and panel reviews. Depending on type, an environmental assessment may vary in intensity in respect of such matters as public participation, depth of study, and whether there will be a formal hearing. Projects requiring a comprehensive study assessment are listed in the Comprehensive Study Regulation.⁵⁰ These projects are likely to result in significant environmental effects. The Agency's examples are large oil and natural gas developments, some projects in national parks, and larger projects that can cause harm in migratory bird sanctuaries.⁵¹ Of the thousands of assessments conducted annually under the CEAA more than 99% are screenings.⁵² As further described later in this paper, the responsible authority may refer a screening of a project to the Minister of the Environment to "bump up" a review to a panel review or a mediation where there is uncertainty regarding whether the project as mitigated will result in significant adverse environmental effects, where the project as mitigated will likely result in significant adverse environmental effects, or where public concerns warrant a bump-up.⁵³

Where a project is described on the Comprehensive Study List Regulation the responsible authority must consult with the public regarding the scope of project and any concerns that the public may have. After the consultation the responsible authority must decide whether to continue the assessment as a comprehensive study, or to refer it to the Minister for assessment as a panel review or mediation.⁵⁴

⁴⁸Law List Regulations, S.O.R./1994-636.

⁴⁹Exclusion List Regulation, S.O.R./1994-639.

⁵⁰Comprehensive Study List Regulation S.O.R./1994-638.

⁵¹Government of Canada (2007), Basics of Environmental Assessment. Internet Report. http://www.ceaa.gc.ca/010/basics_e.htm.

⁵²See Review of the Canadian Environmental Assessment Act, Cat. No. EN 194-211-1999E (Ottawa: 1999) at 25.

⁵³CEAA, *supra* note 1, s. 20(1)(c).

⁵⁴*Ibid.*, s. 21.

The CEAA environmental assessment decision and the subsequent regulatory decision

Whether an environmental assessment proceeds by way of screening, comprehensive study, mediation, or panel review, at the end of the assessment process, CEAA requires that the responsible authority make a decision. This paper calls it the “environmental assessment decision.” That decision is whether, the project, as mitigated, is likely to cause significant adverse environmental effects.⁵⁵ If the responsible authority determines that the project as mitigated will not cause significant adverse environmental effects, then the responsible authority may, in the responsible authority’s discretion, exercise authority to let the project proceed, by, for example, granting a federal authorisation, making a federal loan, or granting an interest in federal land. This paper calls the exercise of discretion to do any these things the “regulatory decision.” If the responsible authority determines that the project, as mitigated, is likely to result in significant adverse environmental effects the CEAA requires the responsible authority to not exercise the regulatory decision in a manner that would allow the proponent to carry out the project in whole or in part, unless the responsible authority finds that the significant adverse environmental effects can be justified in the circumstances.⁵⁶

Type of assessment and a follow-up program

The type of assessment undertaken with respect to a project is important when considering the role of follow-up programme, and consequently the use of adaptive management. The CEAA requires that a follow-up programme be designed and its implementation ensured when a project has undergone a comprehensive study, mediation or panel review.⁵⁷ The Act requires that a need for follow-up programme be considered with respect to screenings, and if needed, that a follow-up programme is designed and its implementation ensured.⁵⁸

As noted in the first part, a follow-up programme is meant to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures intended to mitigate adverse environmental effects of a project.⁵⁹ Follow-up is a critical step in environmental assessment. A well designed follow-up programme will help the government, proponents, and the public

⁵⁵ *Ibid.*, ss. 20 and 37.

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*, s. 37(1)(a) and 38(2).

⁵⁸ *Ibid.*, s. 38(1).

⁵⁹ *Ibid.*, s. 2(1).

determine whether an environmental assessment process carried out in respect of a project was accurate. An environmental assessment, after all, partly involves *predictions* regarding likely environmental effects, and monitoring effects through a follow-up programme can provide information on whether predictions were correct. Mitigation measures also involve *predictions*; they are predictions that the measures will in fact lessen or even negate environment impacts if the measures are carried out. The success of an environmental assessment process under the CEAA, and consequently the environmental protection afforded by a good environmental assessment process, depend on whether the predictions regarding significant adverse environmental effects and mitigation measures are correct.

The Agency's Operational Policy Statement, Follow-up Programs under the Canadian Environmental Assessment Act,⁶⁰ reflects the CEAA provision that a responsible authority is not limited by its own legislative mandate in designing a follow-up programme.⁶¹ The CEAA allows the responsible authority to consider any mitigation measures that are within the legislative authority of the federal government, and any other measures "whose implementation the responsible authority can ensure" or that the responsible authority is satisfied will be "implemented by another person or body."⁶² So, for example, a responsible authority may include mitigation measures in his or her calculation of whether there are significant adverse environmental effects that would be enforced under a provincial authorisation, or by some other non-federal authority, such as a municipality. However the responsible authority must have good reason to believe that such mitigation measures will be implemented and enforced.

Two aspects of adaptive management in follow-up

As noted in the first part, Subsection 38(5) of the CEAA enables the results of a follow-up programme to be used for implementing adaptive management measures or for improving the quality of future environmental assessments. There are two distinct aspects to Subsection 38(5). The first is that follow-up may be used for *implementing adaptive management measures*. These would be measures, presumably pursuant to federal or provincial authorisations, that require a project proponent to invoke alternative environmental management measures if it turns out that predictions regarding environmental effects, or predictions regarding the

⁶⁰Canadian Environmental Assessment Agency. Follow-up Programs under the Canadian Environmental Assessment Act. Operational Policy Statement. Canadian Environmental Assessment Agency Website <http://www.ceaa.gc.ca/default.asp?lang=En&n=499F0D58-1>.

⁶¹*Ibid.* at 2, and CEAA, *supra* note 1, s. 20(1.1).

⁶²*Ibid.*

effectiveness of mitigation measures, were wrong. If this provision is to be used, it is critical that either authorisations be flexible enough to require alternative environmental management strategies, or the applicable legislation authorises the regulator to revisit authorisations in this manner.

The second aspect of Subsection 38(2) is that adaptive management be *used to improve the quality of future environmental assessments*. This is a positive aspect of adaptive management aimed at future environmental sustainability. It is critical that information gleaned in follow-up programmes be available for use in future environmental assessments. This monitoring, reporting, storing, and dissemination of information are vital.

Certainty of mitigation measures notwithstanding adaptive management

The CEAA requires that the responsible authority have a high level of certainty that mitigation measures will in fact work. Numerous CEAA provisions mandate this interpretation.

First, under CEAA “mitigation” means:

the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.⁶³

Note that the definition does not say the “potential elimination, reduction, or control ... etc.” of adverse environmental effects. Nor does it say “measures that likely will be developed in the future that will eliminate, reduce, or control ... etc.” environmental effects. On the contrary, the definition of “mitigation” makes it clear that to be a mitigation measure for the purposes of the CEAA a measure must be known to actually eliminate, reduce or control adverse environmental effects. This does not necessarily mean that the measure has been tried and was proven successful in past projects. But it does mean that there must be sufficient scientific evidence or other information for the CEAA administrator to reasonably conclude that a mitigation measure is certain and will effectively mitigate adverse environmental effects of a proposed project.

Second, this interpretation is confirmed by Subsections 20(2) and 37(2.1) of the Act which states that the responsible authority must ensure that mitigation measures are implemented or be satisfied that another person or body will implement mitigation measures. Obviously there cannot be uncertainty as to the

⁶³*Ibid.*, s. 2, def. of “mitigation.”

nature or identity of mitigation measures if the responsible authority must be satisfied that mitigation measures will be implemented.

Third, this interpretation is confirmed by clause 16(1) (d) of the CEAA that requires that the relevant CEAA administrator consider “measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project.” If mitigation measure must be technically and economically feasible, and known to actually mitigate an otherwise significant adverse environmental effects, all relevant particulars regarding the measure must be known at the time of the consideration of the measure.

Adaptive management: How does the CEAA fare?

Do the CEAA and its associated regulations and policies correctly interpret adaptive management? Is CEAA’s authorised application of adaptive management adequate, too broad, too narrow?

Regarding the first question, the CEAA’s focusing adaptive management on follow up suggests that it expressly supports passive adaptive management over active adaptive management. Passive adaptive management may be required after a single management approach has been chosen and authorised. Although this is not an incorrect application of the adaptive management, to address the second question, it is a limited one. First the CEAA does not specifically authorise the use of active adaptive management, though, there appears to be nothing in the Act that would prohibit the application of active adaptive management in determining the best management strategy if the originally chosen strategy proved to be deficient. Second, by limiting the application of adaptive management to follow up and environmental assessment processes, by implication it limits the application of adaptive management to the environmental assessment processes related to adaptive management in follow up. So, for example, under the CEAA mitigation requirements could include monitoring and flexible permits to enable alternative environmental management strategies so that follow up plans may be implemented. As well, if the agency overseeing an environmental assessment anticipates a potential for the use of adaptive management in follow up then the agency could consider adaptive management when setting terms of reference and determining public and stakeholder involvement.

However the CEAA is limited with respect to adaptive management as it does not permit its use in some of the other situations that the discussion in the second part identifies as showing potential for applying adaptive management in environmental assessment processes. For example, consider level of assessment. As earlier discussed screenings are the least intense level, followed by comprehensive

studies, followed by panel reviews. If the CEAA more directly was focused on adaptive management it would relate level of assessment not only to type of project but also to type of receiving environment. It would specifically permit or provide justificatory criteria for an overseeing agency's bumping up a screening to a comprehensive study, panel review, or mediation, because a project likely would impact and interrelate with a complex, dynamic ecosystem. As discussed earlier in this part of the paper, under the CEAA a project will undergo a comprehensive study if the project type is listed in the Comprehensive Study List Regulation, for example certain oil and gas projects. Thus the focus is on a type of project, and not on the ecosystem complexity of the receiving environment. As well, the CEAA sets out specific circumstances in which a screening or comprehensive study may be bumped up to a panel review. As discussed earlier, with respect to a bump up from a screening to a panel review or mediation these include uncertainty regarding whether the project as mitigated will result in significant adverse environmental effects, where the project as mitigated will likely result in significant adverse environmental effects, or where public concerns warrant a bump-up. With respect to a bump up from a comprehensive study to a panel review or a mediation, the Environment Minister may consider the "potential of the project to cause adverse environmental effects, ... the ability of the comprehensive study to address issues relating to the project, [and] ... public concerns in relation to the project."⁶⁴ In both bump up situations the focus is on the project and its relationship to the receiving environment, in contrast to the nature of the receiving environment in and of itself. Hence the fact that a receiving environment is complex, dynamic, and vulnerable, and therefore there is greater likelihood that adaptive management be required in follow up, cannot be used as a reason in itself for a higher level of assessment than a screening.

CEAA also is limited in that it does not expressly embrace the potential use of adaptive management in scoping decisions. Although the CEAA scoping provisions are largely discretionary and do not prevent an agency from considering, for example, the complexity and dynamics of the receiving environment in making scoping decisions and thus the potential for the need for an adaptive approach, they do not encourage or require broad scoping in light of a complex receiving environment and the likelihood of highly unpredictable uncertainties. As well recent amendments to the CEAA enable the Minister of the Environment to rescope projects without any set statutory criteria. Accordingly, even the most thoughtfully scoped projects could be downscoped. These amendments were included in the 2010 federal budget bill.⁶⁵

⁶⁴CEAA, *supra* note 1, s. 21(2), s. 2155, adding s. 15.1 to the CEAA.

⁶⁵Budget Implementation Bill, 2010, ss. 2152–2160, and Schedule 3.

The Kearl Mines Case: Mistinterpreting the Role of Adaptive Management in the CEAA, and Lessons for Adaptive Management and Environmental Assessment Generally

The Kearl Mines case

Adaptive management or managing adaptively?

The Pembina Institute for Appropriate Development, *et al.* v. Attorney General of Canada and Imperial Oil Resources Ventures Limited⁶⁶ decision (the “Kearl Mines case”) concerned the February 5, 2007 decision of an environmental assessment conducted by Joint Panel Review (Alberta and the Department of Fisheries and Oceans). The Joint Panel found that there would be no significant adverse environmental effects resulting from the Kearl Project, a proposed oil sands mine north of Fort McMurray including open pit truck and shovel mines, and associated facilities such as for bitumen extraction and tailings management. A number of environmental organisations (“ENGOS”) appealed the Panel’s decision to the court on the basis that it was unreasonable on several grounds. The ENGOS were successful with respect to one of their claims, namely that the Panel erred in determining that the project would have no significant adverse environmental effects relating to climate change because the Panel did give sufficient reasons for the determination.⁶⁷

⁶⁶ *Supra* note 10.

⁶⁷ This aspect of the decision related to the fact that the Project would result in significant greenhouse gas emissions, approximately the equivalent to 800,000 cars per year. The Panel rationalised that these emissions would not result in a significant adverse impact since the proponent would have to comply with the Alberta Climate Change and Emissions Management Act (S.A. 2003, c. C-16.7) requirements for intensity based emission reductions. The ENGOS argued, and the Court agreed, that intensity based reductions would not reduce the Project’s greenhouse gas emissions since, given the Project’s anticipated production increases, intensity based targets would not result in a net reduction of greenhouse gas emissions. Because the Panel’s rationale for its finding of no significant adverse impacts related to climate change failed, there was a legal error in the Joint Panel Review’s decision with respect to significance of environmental impacts. Until the legal error was cured (by the Panel giving supportable reasons) in effect there was no decision of the Panel. After the close of the proceedings, the Department of Fisheries and Oceans (“DFO”) withdrew its Fisheries Act authorisation to harmfully alter, destroy, destruct, or disturb fish habitat (R.S.C. 1985, c. F-14, s. 35(2)). The DFO did this because the CEAA requires that where an environmental assessment is triggered in respect of a project, the assessment must be completed prior to a responsible authority taking action that enables the project to proceed (such as issuing a Fisheries Act approval). Because of the Panel’s error the EA was not complete. Subsequent litigation confirmed the correctness of DFO’s withdrawing its authorisation.

Although the ENGOs won the case on the climate change issue, the Court made some provocative comments about the role of adaptive management in the environmental assessment process. The Court made its comments in the context of explaining its understanding of how the CEAA operates and in the determination of the adequacy of mitigation measures.

One adaptive management issue concerned whether something could count as a mitigation measure when there was uncertainty as to whether the measure would even mitigate an adverse effect. An example from the case was the “mitigation of certain aspects of oil sands mining, e.g., reclamation of peatlands” which the Applicants alleged “is not even known in general terms.”⁶⁸ The Respondents did not disagree with the characterisation by the Applicants, but argued that the “dynamic nature of follow-up measures and adaptive management will resolve initial uncertainties.”⁶⁹ Another example concerned uncertainty relating to the effectiveness, and technical and economic feasibility of end-pit lake (“EPL”) technology. An EPL is a mined out pit that will receive the last of the mature tailings. The theory is that after covering the mining process water with several metres of fresh water in several years a fish bearing lake will result.⁷⁰ The Kearl EPLs were scheduled to become operational on mine site closure, about 60 years hence.⁷¹ The Court acknowledged that there was “some uncertainty with respect to end pit lake technology, the existing level of uncertainty is not such that it should paralyse the entire project.”⁷² From the following excerpt from the Joint Panel Report it is evident that the success of EPLs was dependant on the development of future science and technology:

Imperial Oil identified mitigation options and contingencies that could be applied to the EPLs to ensure that by the time discharges took place, the water would be of acceptable quality. Imperial Oil stated that these might include water treatment and that the pit lake system would be part of a remediation adaptive management programme. Imperial Oil stated that it would demonstrate that it was meeting its objectives in test pits. It maintained that adequate time existed to progressively apply and

⁶⁸Kearl Mines, *supra* note 11 at ¶ 59.

⁶⁹*Ibid.*, ¶ 60.

⁷⁰Collision (2008). The science and evolving practice of applying the end-pit lake to the oilsands, *Air-Water-Land*. June Warren-Nickle’s Energy Group: Calgary. Available at <http://www.airwaterland.ca/article.asp?id=7358>.

⁷¹*Ibid.*, ¶ 57.

⁷²*Ibid.*, ¶ 56.

incorporate key findings from ongoing research and modeling to resolve uncertainties before and after the first pit lakes were completed.⁷³

At the outset it is important to recognise that evolutionary, or trial and error, managing adaptively is proposed in both the reclamation of peatlands mitigation measure and the use of EPLs mitigation measure. In both cases the uncertainty being grappled with is not highly unpredictable uncertainty because of, for example, the complexity of the receiving ecosystems, complex interactions among them, and unknowns regarding future human and social interventions etc. Rather, in each case the uncertainty is that it is not known whether a mitigation technique will work, given the present state of knowledge and the present technology. Accordingly what Imperial Oil is proposing as adaptive management appears to be not true adaptive management at all. It is managing adaptively in an evolutionary fashion, or by trial and error. If this technique does not work, we will try something else.

Kearl Mines decision misinterpreting the role of adaptive management in the CEAA

Three comments on the decision regarding the Kearl decision, the CEAA, and adaptive management

This section of the paper sets out three comments regarding the Kearl Mines decision and how it assumes that the CEAA authorises the use of adaptive management in environmental assessment. It then provides an analysis of the comments and shows how the Kearl court's assumptions were wrong.

The first comment concerns how CEAA addresses the identification of adverse effects and whether it authorises the use of adaptive management to identify adverse effects in the future, when those effects potentially are significant. In paragraph 32 of the Kearl decision the Court asserts:

Adaptive management permits projects with uncertain, yet potentially adverse environmental impacts to proceed based on flexible management strategies capable of adjusting to new information regarding adverse environmental impacts where sufficient information regarding those impacts and potential mitigation measures already exist.

⁷³Joint Panel Report (2007) EUB Decision 2007-013: Imperial Oil Resources Ventures Limited, Application for an Oil Sands Mine and Bitumen Processing Facility (Kearl Oil Sands Project) in the Fort McMurray Area, at p. 43. Available at <http://www.ceaa.gc.ca/050/documents/21349/21349E.pdf>.

Assuming that the Court comments apply to uncertain adverse environmental effects that may prove to be significant, the Court assumes that under the CEAA adaptive management may be used so that a project may proceed where:

- (a) it is not certain that at least partly describable adverse impacts will occur as a result of the project,
- (b) there is some (though it need not be full) information on such uncertain impacts,
- (c) there is some (though it need not be full) information on what might mitigate such uncertain impacts, and
- (d) the project has flexible management strategies that enable it to adjust to new information (to be revealed where?) regarding adverse and potentially significant environmental effects.

(the “uncertain adverse environmental effects comment”).

The second comment deals with adaptive management and mitigation. As mentioned earlier, the CEAA requires that mitigation measures be technically and economically feasible. In the *Kearl* case the ENGO applicants argued that the fact that the panel recommended further testing of predictions relating to EPLs, the proposed mitigation measure was not technically or economically feasible.⁷⁴ The Court did not agree stating that “this approach is broadly consistent with the principles of adaptive management.”⁷⁵ The Court quoted the *Canadian Parks and Wilderness Society v. Canada (Minister of Canadian Heritage)*⁷⁶ as stating:

[t]he concept of “adaptive management” responds to the difficulty, or impossibility, of predicting all of the environmental consequences of a project on the basis of existing knowledge.

Although the statement from the *Canadian Parks and Wilderness Society* case is non-controversial as it stands, the *Kearl* Court then stated:

The same holds true for the assessment of mitigation measures. While there does exist some uncertainty with respect to end pit lake technology, the existing level of uncertainty is not such that it should paralyse the entire project.⁷⁷

⁷⁴*Kearl Mines*, *supra* note 11, ¶ 55.

⁷⁵*Ibid.*, ¶ 56.

⁷⁶*Canadian Parks and Wilderness Society v. Canada (Minister of Canadian Heritage)*, 2003 FCA 197, at ¶ 24.

⁷⁷*Ibid.*

In other words, the Court is saying that CEAA permits some uncertainty with respect to mitigation measures provided that adaptive management is used (the “uncertainty with respect to mitigation comment”).

The third comment concerns the relation between the precautionary principle and adaptive management. The Kearl Court, referring again to the Canadian Parks and Wilderness Society decision⁷⁸ states:

“... adaptive management counters the potentially paralysing effects of the precautionary principle.”

In other words, the Court states, in effect, that under the CEAA what the precautionary principle giveth to environmental protection, the principle of adaptive management may taketh away (the “adaptive management offset to the precautionary principle comment”).

In the writer’s view, the uncertain adverse environmental effects comment [Comment #1], the uncertainty with respect to mitigation finding [Comment #2], and the adaptive management offset to the precautionary principle finding [Comment #3] are not supported, and run contrary to the CEAA for numerous reasons. The following section sets out reasons why.

Discussion of comments

The reasons why CEAA does not permit adaptive management in the contexts set out in Comments #1 and #2 are as follows:

- (i) The CEAA is drafted in a manner that anticipates that an environmental assessment identifies the environmental effects that *may* result from the project.⁷⁹ This would include any identifiable yet uncertain environmental effects that may occur as a result of the project. There is nothing in the CEAA that prohibits a project from proceeding if the project may have merely adverse effects. However the Act prohibits a project from proceeding if, taking into account mitigation measures, the project likely will have significant adverse environmental effects that cannot be justified in the circumstances.⁸⁰
- (ii) The CEAA sets out requirements regarding the nature of the mitigation measures that may be considered in the environmental assessment process. as mentioned earlier, first, mitigation measures must be technically and

⁷⁸*Ibid.*

⁷⁹CEAA’s definition of ‘environmental effect’ is “... in respect of a project, ... (a) any change that the project may cause in the environment”. See CEAA *supra* note 1, s. 2(1).

⁸⁰CEAA, *supra* note 1, ss. 20 and 37.

economically feasible,⁸¹ Second, for a measure to be considered to be a “mitigation measure” in the environmental assessment process, the measure must in fact mitigate significant adverse environmental effects.⁸² Third, the entity overseeing the assessment must assure that mitigation measures that the process identifies as mitigating significant adverse environmental effects will be implemented.⁸³

- (iii) It follows from the just described CEAA requirements that the CEAA does not authorise adaptive management as contemplated in Comment #1 or Comment #2. Regarding Comment #1, when uncertain but adverse environmental effects may be caused by the project and they are significant, the CEAA requires that any mitigation measures be identified, be determined to be technically and economically feasible, and be assured to be implementable. The scenario contemplated in Comment #1 does not meet any of these conditions. Regarding Comment #2, the described CEAA requirements make it clear that any mitigation measures relating to significant adverse environmental effects must not be uncertain.
- (iv) Adaptive management in the CEAA is expressly authorised only in relation to *follow-up*. Nothing in the Act suggests that adaptive management works so that projects with uncertain, yet potentially significant adverse environmental effects may proceed through the use of adaptive management [Comment #1].⁸⁴ Nor does anything in the Act suggest that adaptive management may be used to let projects be considered to be mitigated even through there is uncertainty regarding what might constitute mitigation [Comment #2]. As mentioned under (ii) above, mitigation measures must be identified in the environmental assessment process, must actually mitigate significant adverse environmental effects, must be technically and economically feasible, and must be implementable.

⁸¹ *Ibid.* s. 16(1)(d).

⁸² *Ibid.*, s. 16(1)(d) provides “Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of ... measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project.

⁸³ *Ibid.*, ss. 20 and 37.

⁸⁴ The exception to this is that the CEAA allows a project that will have significant adverse environmental effects to proceed that cannot be mitigated if it is otherwise justified in the circumstances. See CEAA, *supra* note 1, ss. 20(1)(b) and 37(1)(a)(ii). As the CEAA gives no indication as to what would count as being justified in the circumstances, in theory an adoption of an adaptive management plan could qualify. I thank a referee of this paper for this point.

- (v) By the application of the legal principle *expressio unius est exclusio alterus*, the express mention that adaptive management may be used in follow-up implies that it may not be used in other processes or determinations in the CEAA, unless those relate to follow up.⁸⁵ If Parliament meant that adaptive management could be used in tempering what might be a “significant” adverse environmental effect, or authorising uncertain mitigation measures to count as mitigating a significant adverse environmental effect, Parliament would have stated so.
- (vi) Specific adaptive management provisions in the CEAA were added by amendment to the Act October 30, 2003.⁸⁶ Accordingly, case law that precedes this date that suggests that adaptive management may apply to determinations under the CEAA other than relating to follow-up may not be applicable. All of the cases referred to in the Kearl decision in relation to adaptive management concerned legislation prior to the 2003 CEAA amendments.
- (vii) The Kearl Court’s use of *Canadian Parks and Wilderness Society v. Canada (Minister of Canadian Heritage)* for authority regarding when it is appropriate to use adaptive management in the CEAA with respect to Comments #1 and 2 are misguided because in that case adaptive management was used in relation to the Minister of the Environment’s responsibilities under the *Canada National Parks Act*⁸⁷ and not under the CEAA. The provisions of the *Canada National Parks Act* considered in the case are totally dissimilar to CEAA provisions regarding significance, mitigation, or adaptive management.
- (viii) There is a specific place for *uncertain significant adverse environmental effects* in the CEAA and it does not have anything to do with the situation that relates to Comment #1. The CEAA requires, when an assessment

⁸⁵ See the third part of this paper relating to the environmental assessment processes that relate to the use of adaptive management in follow up.

⁸⁶ *Supra* note 2.

⁸⁷ *Canadian Parks and Wilderness Society v. Canada (Minister of Canadian Heritage)*, *supra* note 76, ¶ 22. The Applicants were not challenging the CEAA environmental assessment process (*ibid.*, ¶ 22). They only were challenging whether the Heritage Minister properly exercised his authority under the *Canada National Parks Act* (S.C. 2000, c. 32), in approving a winter road through Wood Buffalo National Park. The main issue was whether, in approving the road, had properly exercised the Minister’s duty under Subsection 8(1) of the Act to make “ecological integrity” a “first priority.” The Court of Appeal found that the Minister’s decision was rational and did not run contrary to the Subsection 8(1) duty, especially considering proposed mitigation and the use of adaptive management.

proceeds by way of a screening, and “it is uncertain whether the project, taking into account the implementation of any mitigation measures ... is likely to cause significant adverse environmental effects ... the project shall be referred to a mediator or a panel review.”⁸⁸ Since the CEAA requires, at least when a project proceeds by way of screening, that if it is uncertain whether a project, as mitigated, will have significant adverse environmental impacts, then the project must go to mediation or a panel, it would be contrary to the CEAA for a responsible authority, in the face of uncertainty, to use adaptive management in an attempt to deal with uncertain impacts.

- (ix) Following on the last point, the fact that CEAA mentions uncertain significant adverse environmental effects only in relation to screenings suggests that the administrators of the Act are meant to resolve any remnant uncertainty when a screening is bumped up to a mediation or panel review. These assessment streams generally are more comprehensive and intensive than are screenings. The logic of the Act suggests that any uncertainty regarding significant adverse environmental effects likely would be resolved through the bump up.
- (x) Although the CEAA does not give specific guidance to a responsible authority regarding uncertainty of the likelihood of significant adverse environmental effects when a project proceeds by way of comprehensive study, panel review, or mediation, nothing in the CEAA suggests that adaptive management is a proper way to attempt to address any uncertainty address any uncertainty relevant to approval judgments concerning the significance of adverse effects. As noted, the CEAA expressly authorises the use of adaptive management only in respect to *follow-up*.

CEAA and the nature of uncertainty that adaptive management may address

As a final comment in this section, from the above analysis of the CEAA it follows that that in the CEAA adaptive management is meant to apply to non-significant adverse environmental effects and effects that are highly unpredictable uncertainties. The discussion has shown that under the CEAA if an environmental effect may occur, even if it is not certain it will occur, and if that effect is significant, then not only must that effect be identified in the environmental assessment report, any mitigation measures must be identified, be technologically and economically feasible, must be known to work, and must be implementable. Note, however, this does not rule out the use of adaptive management in follow in case predictions regarding success of measures designed to mitigate significant and other effects

⁸⁸CEAA, *supra* note 1, s. 20(1)(c)(i).

prove to be wrong. Even given our best science, public and stakeholder input, and traditional knowledge, the enormous complexity of interactive systems and human influences on these systems, may render even the most solid predictions in the end to be wrong. Note as well that the resulting adverse environmental effect disclosed in monitoring and follow up when a prediction concerning the success of mitigation measures proves wrong will be an highly unpredictable and uncertain effect. If the effect were predictable or certain at the time of the environmental assessment, then the failed mitigation measure would not have counted as a mitigation measure under the CEAA since it would not have been known to work at the time of the assessment.

Precautionary Principle and Adaptive Management

The Whites Point Quarry Report, adaptive management, and the precautionary principle

The Joint Review Panel Report on the White Point Quarry and Marine Terminal Project called on the Agency to produce guidelines for participants in the environmental assessment process regarding the role of adaptive management in the federal environmental assessment process.⁸⁹ This Report concerned Bilcon of Nova Scotia Corporation's (the Proponent's) proposal to "construct, operate and decommission a large basalt quarry, processing facility, ship loading facility and marine terminal at Whites Point, Digby County, Nova Scotia, for the export of aggregate to New Jersey."⁹⁰ In a number of places the Panel notes how the proponent confuses adaptive management with the precautionary principle. For example, the Panel notes:

The Panel found little evidence from the EIS, information requests or the hearings to indicate that the Proponent appreciates the difference between the precautionary principle and adaptive management, how each should be implemented or how fundamental the role of science is in the proper implementation of each. The Panel believes that given the Proponent's flawed understanding, the eventual application of these tools would potentially negate any positive intention to offset potential environmental impacts.⁹¹

⁸⁹Environmental Assessment of the Whites Point Quarry and Marine Terminal Project, Joint Panel Review Report, October 2007. Available at http://www.ceaa.gc.ca/B4777C6B-docs/WP-1837_e.pdf at ¶ 5.

⁹⁰*Ibid.*, at p. 1.

⁹¹*Ibid.* at p. 92.

This part of the paper aims to distinguish the precautionary principle from adaptive management. In doing so it argues that the notions do not, in the CEAA, offset the other, as described in Comment #3.

CEAA and the precautionary principle

Subsection 4(2) of the CEAA states:

Duties of the Government of Canada

In the administration of this Act, the Government of Canada, the Minister, the Agency and all bodies subject to the provisions of this Act, including federal authorities and responsible authorities, shall exercise their powers in a manner that protects the environment and human health and applies the precautionary principle.⁹²

The CEAA does not define “precautionary principle.” However the term has been defined or mentioned in other federal statutes and in international agreements to which Canada is a signatory. For example, the Canadian Environmental Protection Act, 1999⁹³ characterises the precautionary principle as follows:

2. (1) In the administration of this Act, the Government of Canada shall, having regard to the Constitution and laws of Canada and subject to subsection (1.1),
 - (a) exercise its powers in a manner that protects the environment and human health, applies the precautionary principle that, where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation, and promotes and reinforces enforceable pollution prevention approaches ...

The preamble to the 2002 Canada National Marine Conservation Areas Act⁹⁴ sets out a similar characterisation of the principle, minus the “cost effective measures” limitation. As well, under the Act the principle applies when there are merely “threats of environmental damage” and not “serious or irreversible damage” as set out in the Canadian Environmental Protection Act. The 2002 Act states:

Whereas the Government of Canada is committed to adopting the precautionary principle in the conservation and management of the marine

⁹²CEAA, *supra* note 1.

⁹³Canadian Environmental Protection Act, 1999 S.C. 1999, c. 33.

⁹⁴Canada National Marine Conservation Areas Act, S.C. 2002, c. 18.

environment so that, where there are threats of environmental damage, lack of scientific certainty is not used as a reason for postponing preventive measures

The preamble to the 1996 Oceans Act⁹⁵ states that "... Canada promotes the wide application of the precautionary approach to the conservation, management and exploitation of marine resources in order to protect these resources and preserve the marine environment" and later characterises a precautionary approach as one that is "erring on the side of caution."⁹⁶ This characterisation is not very instructive as it does not give guidance as to what "erring on the side of caution" means.

The precautionary principle has been recognised as a principle of international law. A well known version of the principle is from the Rio Declaration⁹⁷ which is the same as the one in the Canadian Environmental Protection Act which states:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

However, other versions in international agreements contain neither the "cost effective" limitation" nor the requirement that environmental threats be "serious" or would have "irreversible damage." For example, the Cartagena Protocol on Biosafety, while affirming the precautionary principle in the Rio Declaration, formulates a stronger version:

Lack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of a living modified organism on the conservation and sustainable use of biological diversity in the Party of import, taking also into account risks to human health, shall not prevent that Party from taking a decision, as appropriate, with regard to the import of the living modified organism in question ... in order to avoid or minimise such potential adverse effects.⁹⁸

⁹⁵Oceans Act, S.C. 1996, c. 31.

⁹⁶*Ibid.*, s. 30(c).

⁹⁷United Nations Conference on Environment and Development: Rio Declaration on Environment and Development, 14 June 1992, 31 I.L.M. 874.

⁹⁸Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 29 January 2000, 39 I. L.M. 1027.

Academics discuss what are called “weak” and “strong” versions of the precautionary principle.⁹⁹ A very weak version of the precautionary principle would hold that mitigation measures, if they are economically feasible, or risk avoidance, are justified only where there are serious or irreversible threats to the environment or health. An example of a weaker version of the precautionary principle is the version from the Canadian Environmental Protection Act, noted above. A strong version of the principle would hold that where there are possible, even if uncertain risks, to the environment or health, mitigation measures or risk avoidance are justified (or required, depending on the version). A strong version would not limit mitigation measures to those that are economically feasible. An example of a stronger version is the one from the Canada National Marine Conservation Areas Act noted above. A very strong version is offered by Jamie Benidickson *et al.* in their *Practicing Precaution and Adaptive Management: Legal, Institutional and Procedural Dimensions of Scientific Uncertainty*,¹⁰⁰ namely that,

“when scientific uncertainty is high, and the potential for substantial negative (but possibly unexpected) effects exists, administrative decision-making should err on the side of caution.”¹⁰¹

There are no court interpretations on the meaning of the precautionary principle in the CEAA and so it is difficult to conclude whether Parliament meant a strong or weak version. However an interpreting court likely would apply the legal statutory interpretation principle *in pari materia* — the rule that laws on the same subject should be construed together.¹⁰² Applying the principle a court likely would find that the CEAA includes at least a moderate version of the principle where there must be a lack of scientific certainty and at least the potential for material adverse environmental impacts in the situation for the principle to apply. This version would reflect the common elements in other federal statutes that include the principle. This version may be contrasted with the Benidickson one where the precautionary principle would apply where *scientific uncertainty is high*, an element not present in any of the mentioned Canadian statutes. There being only a lack of scientific certainty (in contrast to high scientific uncertainty) implies that there is some, and perhaps even considerable, scientific evidence that a project will result in a material adverse environmental impact; it just is not certain that the project will have that effect.

⁹⁹E.g.: David *et al.* (2002–2003) and LaFranchi (2005).

¹⁰⁰SSHRC Report (2005). Available at http://www.uottawa.ca/ie/English/Reports/JBPP_Final_Report.pdf.

¹⁰¹*Ibid.*, at A-2 and B-5.

¹⁰²Sullivan and Driedger (2002).

The precautionary principle in the context of the CEAA

Applying the adopted characterisation of the precautionary principle, the CEAA requires the government, in administering the CEAA, exercise powers in a manner so that when there is scientific uncertainty and a potential for at least material adverse environmental impacts, the government should err on the side of caution. How would this duty operationalise in the context of a CEAA environmental assessment? One way to determine this would be to identify CEAA administrative duties and consider how applying the precautionary principle might be carried out.

Here is a non-comprehensive list of administrative duties under the CEAA:

- (i) Section 15 duties relating to determining scope of project,
- (ii) Section 16 duties relating to determining scope of assessment,
- (iii) Subsection 18(3), making a determination regarding the appropriateness of public participation in a screening,
- (iv) making a determination under clause 16(1)(d) as to whether proposed mitigation measures are “technically and economically feasible” and that they “would mitigate any significant adverse environmental effects of the project,”
- (v) making a determination of what constitutes “significant adverse environmental effects of the project,”
- (vi) making a determination of the “need for, and the requirements of, any follow-up programme in respect of the project” under clause 16(2)(c),
- (vii) making a determination of the “capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future” under clause 16(2)(d),
- (viii) making a determination of whether to consider “Community knowledge and aboriginal traditional knowledge” in conducting an environmental assessment under Section 16.1,
- (ix) making a determination as to whether a screening should be bumped up to a panel review under clause 20(1)(c) or Section 25,
- (x) making a determination as to whether a comprehensive study should be bumped up to a panel review under Section 21.1,
- (xi) considering whether a project can be justified in the circumstances where there is a determination that the project, as mitigated, will have significant adverse environmental effects, under Section 20 or 37,
- (xii) considering the need for a follow-up programme under section 38, determining what will be included in a follow-up programme, and implementing a follow-up programme.

It is easy to imagine circumstances in which the precautionary principle could come into play when an administrator is carrying out any of the above duties. This paper will consider only a few.

Regarding (i), if a project as described by the proponent would likely to have significant adverse environmental effects, and there is scientific uncertainty as to the magnitude or impact of the effects, or whether the effects can be mitigated, the responsible authority would be operationalising the precautionary principle if the responsible authority determines not to downscope the project to a point to where there would no longer be significant adverse environmental effects to the project as scoped.

Regarding (ix) or (x), if a project would likely have significant adverse environmental effects, and there is uncertainty as to as to the magnitude or impact of the effects, or whether the effects can be mitigated, the administrator would be operationalising the precautionary principle if he or she “bumps up” an assessment to a panel review to better ensure that potential impacts are more fully explored and the public has opportunities to participate in the assessment process.

Regarding (viii), if a project as described by the proponent would likely to have significant adverse environmental effects, and there is scientific uncertainty as to the magnitude or impact of the effects, or whether the effects can be mitigated, in applying the precautionary principle, the responsible authority would be operationalizing the precautionary principle if the responsible authority decides to consider community knowledge and aboriginal traditional knowledge in an attempt to reduce uncertainty, one way or the other.

The precautionary principle in contrast to adaptive management

An important distinction between the precautionary principle and adaptive management is that the CEAA requires that the precautionary principle be exercised in all circumstances in administering the Act. The role of adaptive management is much more circumscribed. The CEAA only mentions adaptive management once and it is in Subsection 38(5) which states “The results of follow-up programs may be used for implementing adaptive management measures.” Accordingly the two notions do not offset each other as described in Comment #3. On the contrary, the precautionary principle tempers the application of adaptive management, since the precautionary principle is to be applied in respect of all responsibilities under the CEAA including Section 38, follow up. Hence, if there is any question about whether a follow up programme should be required, applying the precautionary principle a responsible authority should require a programme and insure that

appropriate adaptive management techniques will be implemented including appropriate and flexible project design and mitigation measures.

It is true that both adaptive management and the precautionary principle deal with uncertainty. This does not mean that they offset each other. It is important to distinguish the nature of the uncertainty to which each is applicable. Adaptive management is aimed at addressing highly unpredictable uncertainties. The precautionary principle, at least a moderate to weak version of the principle, would apply when there is some, and perhaps even considerable, scientific evidence that an effect will occur, but there is not scientific certainty that it will occur. So the precautionary principle deals with impacts that we have a lot more evidence for than highly unpredictable uncertainties. As well, with most versions of the precautionary principle, the threat must be identified. We cannot normally apply the precautionary principle to avoid or mitigate a threat if we do not know what the threat is. Adaptive management is aimed at dealing with surprises, because of the complexity of the receiving ecosystems, interactions among them, the unknown future impacts of humans and cumulative effects of projects etc. These differences in the nature of the uncertainty of impacts and threats that apply to adaptive management in contrast to the precautionary principle also support the claim that adaptive management does not offset the precautionary principle.

Summary, Conclusions, a CEAA Path Forward, and General Lessons

Summary and conclusions: The role of adaptive management in CEAA processes

The legislated role of adaptive management in CEAA processes at first blush appears quite narrow. The term “adaptive management” only is mentioned with respect to follow-up programmes. Accordingly it should be applied only with respect to follow and other environmental assessment processes as that process related to the probable role of adaptive management in follow up. However there are many such environmental assessment processes. The second part of this paper sets out how anticipating adaptive management in follow up could be relevant in project planning and design, level of assessment, scope of project and assessment, terms of reference, determination of public and stakeholder involvement, review of adequacy of assessment, determination of mitigation, monitoring, and follow up. Nevertheless, bear in mind that the focus of the use of adaptive management in these processes must be on account of its relevance to its use in follow up. So, for example, adaptive management is relevant to mitigation measures because mitigation measures must be designed to be flexible so that they can be adapted in

case monitoring information leads the regulator to require alternative mitigation strategies. However adaptive management cannot be used under the CEAA to justify uncertain or unknown mitigation measures.

The paper also showed how under the CEAA the only logical role for adaptive management is in follow up with respect to highly unpredictable uncertainties, or to deal with adverse but not significant adverse, environmental effects. As argued, this does not rule out the use of adaptive management in case predictions regarding the success of mitigation measures regarding likely adverse environmental effects prove to be wrong.

The paper also concluded that adaptive management in the CEAA does not offset the precautionary principle. The precautionary principle applies to the entire administration of the Act whereas adaptive management applies to only follow up and necessarily related environmental assessment processes. Although the precautionary principle must be applied in designing a follow up program including any adaptive management program, nothing in the Act suggests that adaptive management offsets the precautionary principle. Also, although both adaptive management and the precautionary principle deal with uncertainty the precautionary principle deals with risks that are identified but there is not scientific certainty that they will occur. There is however, some, and perhaps even considerable, evidence that they may occur. Adaptive management by contrast deals with highly unpredictable uncertainty. With this kind of uncertainty there may be no current scientific evidence that specific threats may result from a project. Highly unpredictable and uncertain adverse effects result from a project because of the complexities of ecosystems, interactions within the systems in conjunction with impacts by an interactions with humans and their activities. By their nature they are not easily predictable.

A CEAA path forward

CEAA 7 year review

Canada is in an excellent position to see that adaptive management principles properly be incorporated into environmental assessment processes and that adaptive management be implemented in regulatory decisions, monitoring, and follow-up. This is because the CEAA itself requires that within 7 years of its last review a Parliamentary review by Committee commence to comprehensively review the provisions and operation of the Act.¹⁰³ The last CEAA review

¹⁰³An Act to Amend the Canadian Environmental Assessment, S.C.2003, c. 9, s. 32(1) (Bill C-9). Royal assent of Bill C-19 was June 11, 2003.

culminated in the 2003 amendments to the Act, including provisions concerning adaptive management and the precautionary principle. Seven-year review should be commencing some time in 2010. Accordingly, Parliament will have opportunity to review the operation of those provisions since 2003. Parliament could amend and clarify the CEAA to overcome the misinterpretation of adaptive management by proponents and courts. In particular the author would urge the following:

The CEAA could be amended to:

- (i) Authorise federal regulators to require changes in environmental management if adaptive management demonstrates that predictions about significance of environmental effects or the success of mitigation were wrong. The limitation on such amendment is that it would only apply to federal authorisations and the CEAA enables the responsible authority to consider mitigation measures that are enforced by a non-federal entity, such as a province.¹⁰⁴
- (ii) Require that federal regulators consider the need for adaptive management plans when the receiving environment's ecosystems are complex and there are highly unpredictable uncertainties regarding potential impacts. Adaptive management used in follow up would ideally reduce vulnerability to the negative effects resulting from such uncertainties.
- (iii) Require that environmental assessment methodologies that address system interactions.¹⁰⁵
- (iv) Include decision criteria favouring adaptability in the selection among alternatives, and adaptable design of proposed projects.¹⁰⁶
- (v) Require that authorisations that enable a project to proceed contain adaptive management provisions, where appropriate, to ensure that the capacity for adaptive response is in place.¹⁰⁷
- (vi) Require that there are mechanisms in place to establish monitoring and adaptive management arrangements that are integrated regionally and sectorally to better address cumulative effects.
- (vii) Clarify the relationship between the precautionary principle and adaptive management. The Act could make it clear that adaptive management does not

¹⁰⁴ *Supra* note 1, s. 20(1.1).

¹⁰⁵ A referee points out that Beanlands and Duinker (1983) made the recommendation that environmental assessment address system interactions.

¹⁰⁶ Thanks to a referee for this point.

¹⁰⁷ Where not all approvals are under federal control, the ct could require federal regulators, not to issue a needed federal approval, unless any needed provincial approvals contain adaptive management provisions.

offset the precautionary principle and that adaptive management only applies to follow-up programmes, including monitoring aspects.

Finally, the CEAA could be amended to clarify the role of adaptive management in the environmental assessment process to better ensure that it is not used to lend “certainty” to uncertain mitigation measures, or to “lessen” the significance of otherwise significant adverse environmental impacts.

General lessons for adaptive management and environmental assessment

This paper has set out the use, both actual and potential, and the abuse of adaptive management in environmental assessment processes generally, and in the federal Canadian process. Through this discussion many general lessons — not just specific to Canada — may be gleaned regarding how to best incorporate adaptive management into environmental assessment processes, and regarding what to avoid. The following examples of lessons assume that those who oversee environmental processes, who carry them out, or participate in them (“environmental assessment practitioners”) support and advocate the effective use of adaptive management in appropriate situations.

- Environmental assessment practitioners should appreciate and understand the role of adaptive management external to the environmental assessment process in order to use adaptive management during and after the environmental assessment process in a manner that reflects its proper usage, and that will positively affect environmental quality.
- Environmental assessment practitioners should understand the distinctions among active, passive, and evolutionary or trial and error adaptive management and realize that only the first two are true adaptive management. They should appreciate that using evolutionary methods over active and even passive adaptive management in inappropriate situations may open the door to uncertain and ineffective mitigation measures, faulty determinations of significance of environmental effects, inferior environmental management, and consequently the potential for greater environmental harm.
- Related to the last point, environmental assessment practitioners should be aware of incorrect or abusive uses of adaptive management in environmental assessment processes. This includes invoking adaptive management to temper the significance of adverse environmental effects, or to attempt to make more certain, uncertain mitigation measures.

- Environmental assessment practitioners should understand the distinctions between the precautionary principle and adaptive management and appreciate that one does not offset the other.
- Environmental assessment practitioners should avoid downscoping or supporting downscoping a project or assessment to lessen complexity or uncertainty in a manner that would eliminate the potential for using adaptive management where traditional regulatory approaches would be insufficient to address project impacts.
- Environmental assessment practitioners should choose or support a level of assessment that will enable a comprehensive enough review to gather information sufficient for incorporating adaptive management into the assessment and subsequent project management.
- In order for adaptive management to be optimally functional at the monitoring and follow up stages, environmental assessment practitioners should anticipate, plan for, and strive to best accommodate it at numerous earlier environmental assessment stages. In addition to ensuring or supporting appropriate scope of project, scope of assessment, and level of assessment, actions include:
 - acquiring appropriate baseline data (e.g. including information regarding the complex systems including an ecosystem characterisation setting out the key components and processes comprising an ecosystem and information on their inter-relationships and links).
 - seeing that the appropriate people are involved in project planning and the environmental assessment including experts and interested groups knowledgeable about ecosystem components or interactions, persons who recognise the limitations of command and control and other traditional management approaches, and persons with concerns or interests regarding models or management strategies that may be invoked in predictions regarding chosen model and strategies are not correct.
 - requiring or supporting a requirement that the cumulative effects assessment consider scenarios of interaction of other projects with the proposed project and set out potential impacts and alternative management models to address impacts.
 - requiring or supporting a requirement that the proponent provide project models with adaptable design, which may include flexibility, modularity, safe-fail character, diversity of implementation options, and would engage or facilitate resilient systems in the receiving environment.
 - requiring or supporting a requirement that the proponent provide adaptable mitigation methods.

- Environmental assessment practitioners should require or support a requirement that monitoring design and follow up requirements are appropriate for adaptive management and are implementable.
- Environmental assessment practitioners should require or support a requirement that all project approvals are flexible enough to be accommodate and facilitate the adaptive management plan.
- Environmental assessment practitioners should require or support a requirement that monitoring methods have timely feedback mechanisms so that issues revealed in monitoring can be responded to quickly.

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