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Canadian Environmental Assessment Agency

Operational Policy Statement

Adaptive Management Measures under the *Canadian Environmental Assessment Act*

Purpose

This operational policy statement (OPS) provides best practice guidance on the use of adaptive management measures under the *Canadian Environmental Assessment Act* (the Act).

Development of this document arose from a need to strengthen understanding and application of adaptive management in the federal environmental assessment (EA) process.

Application

This OPS is primarily intended for responsible authorities and regulated authorities¹ who are responsible for conducting EAs under the Act and its regulations.

Federal authorities, proponents, consultants, other jurisdictions and members of the public may also find this document useful for understanding the considerations of the federal government in relation to adaptive management in EA.

Projects outside Canada: For the assessment of projects undertaken outside Canada and any federal lands, the foreign operational environment, laws and policies may influence the use of discretion by responsible authorities under the Act and regulations. Consequently, EA practices outside Canada and any federal lands may differ from those domestically.

Legislative Basis

Reference to adaptive management measures is included under the Act in section 38, specifically in relation to follow-up programs.

Subsection 38(5) states:

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

Explanation of Terms

Adaptive Management Measures

In this OPS, the concept of "adaptive management" and "adaptive management measures" are discussed in the context of federal EA.

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 as a result of the analysis of data generated by a rigorously implemented follow-up or monitoring program. Consequently, the concepts of follow-up and adaptive management are directly linked under the Act and in practice.

Follow-up Program

Under subsection 2(1) of the Act, "follow-up program" is defined as a program for:

- verifying the accuracy of the EA of a project; and
- determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.

For more details about follow-up programs, see the OPS on [Follow-up Programs under the *Canadian Environmental Assessment Act*](#).

Mitigation Monitoring

Mitigation monitoring may be used to verify that mitigation measures were properly implemented and that such measures mitigated the predicted adverse environmental effects as anticipated by the responsible authority in its course of action decision.

While mitigation monitoring on its own does not satisfy all of the requirements for a follow-up program, it may be useful when a formal follow-up program is not mandatory under the Act (e.g. in a screening), to provide indications as to whether mitigation measures are working as planned, and consequently, whether adaptive management measures should be considered.

Considering Adaptive Management in EA

Due to factors such as the complexities of ecosystems and difficulties predicting details of future development, all EAs involve some level of uncertainty regarding the identification of environmental effects, the assessment of their significance and the effectiveness of mitigation measures. The Act implicitly recognizes uncertainty by requiring a follow-up program for all projects that undergo an assessment by comprehensive study or a review panel.

Clear consideration of appropriate mitigation measures and the potential need for adaptive management is important prior to the responsible authority making its section 20 or 37 decision on the course of action. Such considerations will inform the RA's decision so it is well founded and made on the basis of specific commitments and criteria for future actions.

In response to data generated by the follow-up program or monitoring, the proponent, the responsible authority or the regulated authority should be prepared to initiate adaptive management measures if mitigation is not adequate to eliminate, reduce or control adverse environmental effects.

Comprehensive Studies and Review Panels

Follow-up programs are mandatory for projects that undergo a comprehensive study or an assessment by a review panel. The results of a follow-up program may be used to identify the need for and support

the implementation of adaptive management measures. Therefore, projects that undergo comprehensive study or panel review would be expected to often include elements of adaptive management.

Screenings

Follow-up programs are discretionary for projects that undergo a screening type of EA. In those cases where responsible or regulated authorities determine that a follow-up program or mitigation monitoring is appropriate in the circumstances, it may be appropriate that the projects also include provisions for adaptive management.

When Might Adaptive Management be Appropriate?

Some factors that may influence whether it is appropriate to incorporate adaptive management into an EA include:

- the amount of prior experience with the specific type of project in the specific type of environment;
- the possibility that a mitigation measure may not function as intended;
- the possibility that some aspects of the proposed mitigation may not actually be needed, or that they are no longer required;
- the likelihood of other developments or projects that could lead to cumulative environmental effects;
- the extent of knowledge and understanding of key environmental indicators and action thresholds;
- the likelihood of broad-scale environmental change that would affect the project or influence the nature of mitigating its environmental effects;
- the likelihood that advances in scientific knowledge or technology over the life of the project may enable improved mitigation measures;
- the extent to which public concern about specific issues could be alleviated or reduced through a commitment to follow-up or adaptive management as appropriate; and
- the opportunity to learn from the results of follow-up or adaptive management and improve the current project or the quality of future EA.

When Might Adaptive Management not be Appropriate?

In some cases, it may not be appropriate to incorporate adaptive management into an EA. The following are examples of when use of adaptive management may not be appropriate.

Mitigation is not Identified

Section 16 of the Act requires every type of EA to consider measures that are technically and economically feasible, and that would mitigate any significant adverse environmental effects. The implementation of these measures is then taken into consideration by the responsible authority when making its course of action decision. Therefore, it is insufficient to assert that implementation of an unidentified future measure, developed as a result of adaptive management, constitutes mitigation of a predicted adverse environmental effect.

In cases where an adaptive management approach is identified as a contingency to backup the proposed mitigation measures, there must be a clear commitment to implement adaptive management measures if follow-up or monitoring program results indicate that corrective action is warranted.

Commitment to adaptive management is not a substitute for committing to specific mitigation measures in the EA prior to the course of action decision. Adaptive management is an approach involving flexibility to modify mitigation measures or develop and implement additional measures in light of real-world experience.

Uncertainty about Significant Adverse Environmental Effects

If, taking into account the implementation of mitigation measures, there is uncertainty about whether the project is likely to cause significant adverse environmental effects, a commitment to monitor project effects and to manage adaptively is not sufficient.

A commitment to implementing adaptive management measures does not eliminate the need for sufficient information regarding the environmental effects of the project, the significance of those effects and the appropriate mitigation measures required to eliminate, reduce or control those effects.

Where additional information collection or studies are needed over the life-cycle of the project, such studies in themselves should not be considered "mitigation measures".

Likelihood of Significant Adverse Environmental Effects

If, taking into account the implementation of mitigation measures, the project is likely to cause significant adverse environmental effects that can not be justified; the responsible authority shall not exercise any course of action that would enable the project to proceed.

A commitment to monitor project effects and to manage adaptively is not sufficient to meet the requirements of the Act in these circumstances.

Likely Lack of Follow-up Results

If it is unlikely that the information necessary to support adaptive management will be collected through follow-up or monitoring, it is inappropriate to suggest that adaptive management measures should be planned or implemented. The information to support such a program may be unavailable for a variety of reasons. For example:

- the level of management, human resources or financial support required to undertake follow-up during the life cycle of the project is not adequate,
- the monitoring program proposed is insufficient for capturing the data required to make informed adaptive management decisions, or
- understanding of the resource or ecosystem component of concern may be inadequate for the design of appropriate adaptive management measures.

Considerations in Planning for Adaptive Management

The level of planning required for adaptive management should be appropriate to the scale of the project, and to the sensitivity and complexity of the associated issues. The following describes key factors which should be considered when planning for adaptive management.

Baseline Data

Baseline data or information is critical for measuring change in the environment once the project is implemented. Since it is necessary to

establish a baseline against which follow-up data can be compared, systematic collection of appropriate data about the environment (either from existing sources or new studies) should start in advance of project implementation.

The level of effort in establishing baseline data should be tailored to the project. The mitigation measures and follow-up program should be designed based on reliable baseline data. Subsequent decisions about adaptive management measures will then be better informed.

Capacity

There must be a sufficient capacity (e.g. financial and expert resources) and management commitment to undertake and sustain a follow-up program for long-term measurement, evaluation of outcomes and if required, development, implementation and monitoring of adaptive management measures.

Identification of Key Indicators

Environmental indicators can provide information on the health or integrity of an ecosystem. For example, plant or animal species, communities, or special habitats with a narrow range of ecological tolerance may serve as a gauge of ecological conditions within a specified area.

It is important to identify key environmental indicators when planning for follow-up and potential adaptive management measures. The indicators should be used to assess and address assumptions and uncertainties identified in the EA.

Identification of Action Thresholds

Predetermined action thresholds can be used to indicate when environmental performance is below an acceptable level and requires corrective management action. In such cases, adaptive management measures may be required to prevent significant adverse environmental effects.

Adaptive management can also provide an opportunity to review and revise management objectives, and therefore the action thresholds.

Identification of Testable EA Predictions

It is important to establish testable EA predictions when planning a follow-up program or potential adaptive management measures. For example, a prediction about the significance of an environmental effect should be specific enough that once a project is implemented, one is able to observe and collect information, analyse and interpret the data, and draw conclusions about whether the prediction was correct.

Hypotheses should be constructed, tested and utilized in the further application of the scientific approach. Sound prediction methods provide a basis for understanding why change occurs in the environment and how to select adaptive management measures based on those conclusions.

Identification of Adaptive Management Options

Where possible during the EA process, consideration should be given to demonstrating that there are a range of available options to adapt and manage the project should a mitigation measure not function as intended. These options should be technically and economically feasible.

Mechanisms for Implementation

Where circumstances permit, a responsible or regulated authority, or other jurisdiction such as a province, may include conditions for adaptive management in binding documents such as authorizations, permits, contracts, or leases to ensure an effective avenue for implementation. Those conditions could relate to specific follow-up and adaptive management measures, environmental thresholds, or reporting and compliance monitoring schedules. In many cases, conditions of other federal authorities may also be included in binding documents.

Where mechanisms for financial assurances exist, such assurances may also be a valuable tool for ensuring the implementation of the adaptive management measures determined to be necessary during the follow-up program or monitoring.

Jurisdictional Considerations

Some methods for ensuring the implementation of adaptive management measures may exist within other jurisdictions, such as a provincial or territorial government. For example, conditions related to adaptive management may be specified by way of provincial regulations or existing provincial permitting processes.

Working in collaboration with other regulators and jurisdictions will maximize the potential for ensuring effective adaptive management implementation.

Continuation of the Follow-up Program

When an adaptive management measure has been implemented, it is essential that the follow-up program or monitoring continue in order to verify effectiveness and learn from its results. Some adjustment of the original follow-up program may be necessary to account for the changed project circumstances.

Consideration of Climate Change

Climate change may have effects on the need and planning for adaptive approaches, as well as the information used to make such decisions and whether the traditional mitigation measures remain effective. For example, it is important to consider the validity of older scientific data from Canada's northern regions as it may be outdated due to the effects of changing climatic conditions.

Aboriginal Traditional Knowledge and Public Involvement

Aboriginal traditional knowledge, local community knowledge, and public participation are potentially important considerations that may influence the planning, design and implementation of adaptive management. It is important to understand communities' interests in the project and the potential role that they might wish to play in designing and implementing adaptive management strategies and follow-up programs.

Roles and Responsibilities

The following section provides suggested roles and responsibilities that may be undertaken for adaptive management. These should be considered as best practices only, as roles and responsibilities for adaptive management are not specified in the Act.

Responsible Authority/Regulated Authority

Responsible or regulated authorities should ensure that adaptive management is considered and, where appropriate, planned during the EA. The responsible or regulated authority should ensure that the status of the project is monitored and that adaptive management measures are implemented, where follow-up or monitoring indicate that such measures are necessary.

To do so, a responsible or regulated authority may itself design and ensure the implementation of appropriate measures based on the results of the follow-up program, or may delegate those activities to a third party, such as a proponent. In all cases, criteria for implementing adaptive management should be established.

A responsible or regulated authority may request assistance from appropriate federal authorities or from other jurisdictions, as appropriate, to identify which areas require adaptive management measures, especially for areas outside the responsible or regulated authority's expertise.

Proponent

The proponent plays a lead role in planning, designing and implementing adaptive management measures. This should be done in collaboration with responsible authorities, federal authorities and other appropriate parties.

Federal Authority

A federal authority in possession of specialist or expert information or knowledge with respect to a project should, on request, make available that information or knowledge to the responsible or regulated authority. Where it relates to one of the federal authority's recommendations for the EA, that federal authority should assist in the design of a follow-up program, the analysis of generated information or the provision of advice pertaining to appropriate adaptive management measures.

Federal Environmental Assessment Coordinator

The role of the federal EA coordinator is to coordinate the participation of the federal authorities in the EA process for a project where a screening or comprehensive study is, or might be, required. For matters regarding adaptive management, the federal coordinator may facilitate communication, ensure that federal authorities fulfil their obligations under the Act in a timely manner and coordinate the federal authorities' involvement with other jurisdictions.

Other Jurisdictions

Other jurisdictions, such as provinces, territories and Aboriginal governments, may have a role to play to contribute to the design and implementation of a follow-up program or the adaptive management measures.

Cooperative agreements between the federal government and other jurisdictions require close coordination to maximize efficiency and minimize duplication of effort.

Other Stakeholders and Aboriginal Groups

Involvement of the public and Aboriginal groups may be appropriate for the design and implementation of the adaptive management strategy. Input from the public and Aboriginal groups may raise information that is useful for adaptive management or for assessing subsequent activities.

For example, local communities may agree to work collaboratively in the design or implementation of the mitigation monitoring or follow-up program and any subsequent implementation or monitoring of adaptive management measures. Engaging local community members on a follow-up committee is one means to work together and monitor that mitigation is successfully implemented and any unforeseen environmental effects are identified and addressed through adaptive management measures that are then monitored.

Examples of Adaptive Management Measures in EA

Example 1: When Might Adaptive Management be Appropriate? - The Deltaport Third Berth Project²

The following is an example of an EA for which adaptive management was deemed to be appropriate. This is for illustrative purposes to show how planning occurred in the early stages of the EA; the level of effort and details described will vary on a case-by-case basis.

In 2005, the Vancouver Port Authority (VPA), proposed to expand the existing Deltaport container terminal by extending the wharf structure and adding to the existing land base to accommodate a third ship berth. The proposed project was located 35 km south of Vancouver, at the existing Roberts Bank Port facility in Delta, British Columbia.

The EA review of the Delta Third Berth project concluded that changes that were unrelated to the project were occurring in the Roberts Bank ecosystem; therefore, although the project was not expected to result in significant adverse environmental effects, gaps in scientific understanding of the ecosystem in the inter-causeway area lead to some uncertainty.

Responsible authorities recommended that an adaptive management strategy (AMS) be developed for the area to:

- provide advance warning of any potential emerging negative ecosystem trends during project construction and operation, and
- to establish actions that the VPA could undertake to prevent or mitigate negative trends that were linked to the project and found to exceed applicable thresholds.

Objectives of the AMS

The specific goals of the AMS were to reduce scientific uncertainty and to assess the potential for significant negative trends in the ecosystem.

Planning

The planning of the AMS involved a shared review of the environmental information collected by the VPA and the other federal parties. It also included the following activities.

Work Plan Development

- In consultation with regulatory and scientific agencies, the VPA developed a detailed work plan which identified: specific parameters to monitor, data quality objectives, sampling locations, sampling methodologies, and sampling and reporting schedules.

Scientific Advisory Committee

- A Scientific Advisory Committee was established to monitor data and interpret its significance with respect to ecosystem trends.

Identification of Key Indicators

- Key environmental indicators were identified for monitoring to provide indication of negative trends in the ecosystem or to improve the level of understanding of the inter-causeway ecosystem; thereby reducing uncertainty. The components included geomorphology/oceanography, surface water quality, sediment quality, eelgrass and other biota.

Establishing Thresholds

- Existing national, provincial or regional standards for key components were established as thresholds to indicate when adaptive measures may be required. Where no standards existed, a 20 percent effect level or 20 percent change over background levels was selected as the preliminary threshold. For example, in amphipod tests where 100 individuals are evaluated with respect to survival in sediment, the death of 20 would constitute a 20 percent effect.

Identification of Adaptive Management Measures

- If negative changes were detected and attributed to the project, the VPA committed to implement a number of specific, feasible measures.

Scheduling Follow-up and Monitoring

- The first monitoring event for the AMS was scheduled to occur prior to initiation of construction activities and extend for five years following substantial completion of the project. Other key monitoring activities would start prior to construction, continue through construction and extend into operation of the facility.

Triggers for Adaptive Management

- The decisions to adapt the plan or trigger new or modified mitigation measures were to be based on multiple lines of evidence indicating negative trends. If the Scientific Advisory Committee determined that the negative ecosystem trend was significant and attributable to the project, VPA committed to immediately initiate engineering studies of subsequent physical works to mitigate or reverse the negative ecosystem trend.

Implementation of the AMS

- To ensure implementation of the AMS, the VPA and authorities established a Memorandum of Understanding (MoU). The MoU outlined: the purpose of the AMS; specific roles and responsibilities of the Scientific Advisory Committee, Environment Canada and the VPA; dispute resolution mechanisms; and other information pertinent to the AMS. It also included a letter of credit from the VPA

to Environment Canada to stand as security for the VPA to carry out its responsibilities.

Example 2: Implementing Adaptive Management - The Ekati Diamond Mine³

The following is intended to provide an example of how adaptive management measures were implemented as a result of mitigation monitoring.

The Ekati Diamond Mine was a project proposed by BHP Billiton. The project was located in the Northwest Territories, 310 km northeast of Yellowknife.

The Ekati Diamond Mine in the Northwest Territories was subject to an environmental review. The proponent committed to an adaptive environmental management approach and, in part on that basis, the mine was approved.

On implementation, an Independent Environmental Monitoring Agency was created to oversee environmental management for the mine. A monitoring program was developed based in part on workshops involving the mine operator (BHP), BHP's consultants, members of the Monitoring Agency, government regulators, Aboriginal people affected by the project, and environmental groups.

One of the issues of concern was eutrophication of Kodiak Lake, into which sewage from the mine facility was deposited. The concern was that deposition of biological oxygen demanding substances (mainly sewage) and nutrients could lead to depleted oxygen levels under ice in winter and hence to loss of fish. This matter had been addressed in the licensing, but there was some residual uncertainty whether the restrictions on the sewage effluent would be adequate to protect the fish in the lake. For this reason, oxygen levels in Kodiak Lake were monitored regularly.

In early 1998, a member of the Independent Environmental Monitoring Agency noticed that the oxygen levels were dropping and that they could soon become unacceptably low. As a result of this observation, BHP initiated new measures. It cleared the snow off the lake and injected compressed air under the ice. Dissolved oxygen became very low compared to control lakes, but the levels were adequate to permit fish to

survive the winter. No evidence of a fish kill was observed when a survey was conducted in 1998. In 1999, following further evidence that oxygen was again low, BHP aerated the lake and diverted its sewage to another location.

This illustrates how an adaptive environmental management program is intended to work. The carefully designed monitoring program provided data. The evaluation program determined from the data that a problem was imminent before the problem was unavoidable. A management response (aeration of Kodiak Lake followed by diversion of the sewage) was implemented to avoid the adverse impact that might have arisen. The adaptive environmental management program dealt with the uncertainty of how the lake ecosystem would respond to the various loadings imposed on it and the most serious adverse impacts were avoided through effective management.

Additional Information

For more information on this OPS or on the requirements of the Act, please contact the Agency office in your region.

Head Office:

<http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=16C9C18C-1>

Regional Offices:

<http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=12D96EC7-1>

Additional Agency policies and guidance can be found on the Agency's Web site at:

<http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=D75FB358-1>.

Disclaimer

This guide is for information purposes only. It is not a substitute for the Act or any of its regulations. In the event of any inconsistency between this guide and the Act or regulations, the Act or regulations, as the case may be, would prevail.

To ensure that you have the most up-to-date versions of the Act and regulations, please consult the Department of Justice Web site at <http://laws.justice.gc.ca>.

Updates

This document may be reviewed and updated periodically by the Canadian Environmental Assessment Agency (the Agency). To ensure that you have the most up-to-date version, please consult the Guidance Materials page of the Agency's Web site at <http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=DACB19EE-1>.

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This document is also available in Adobe's Portable Document Format [PDF - 66 KB].

Alternative formats may be requested by contacting: publications@ceaa-acee.gc.ca.

Comments and Feedback

The Agency would appreciate receiving comments on the content of this guide and feedback regarding whether the guidance effectively meets your needs. Comments received will be considered for future updates.

Please submit your comments to training.formation@ceaa-acee.gc.ca.

¹ An entity, referred to in sections 8 to 10 of the Act, for which regulations have been made regarding the manner in which EAs are to be conducted, for example, Canada Ports Authorities.

² Vancouver Port Authority, Hemmera Envirochem Inc. Deltaport Third Berth Project Adaptive Management Strategy. April 2006.

³ Ross, William A. Adaptive Environmental Management as a Tool for Managing Environmental Impacts. 1999

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