Towards a working framework for 'best'-practice EA follow-up: lessons from Canadian case studies

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Abstract: Feedback is basic to the learning process. Although the need for some form of environmental assessment (EA) follow-up is widely recognized, follow-up in the post-consent decision stages is performed in only a minority of cases; where it is done, it is rarely done well.There is a considerable literature on follow-up-related themes; however, much of the emphasis focuses on the development of procedural frameworks which, while important, pay relatively little attention to *how* to do good follow-up. Based on an examination of Canada's extensive experience with EA follow-up, both the successes and the lesser successes, this paper illustrates a number of principles that emerge from recent EA applications to facilitate the development of 'best'-practice follow-up programs. Through the identification of 'best'-practices, including reconsidering the scope of current legislation and specifying follow-up program goals and objectives, this paper suggest ways in which we might move Canadian EA forward through a broader and a somewhat more practical approach to obtaining feedback on project developments and our EA efforts.

Keywords: *Environmental assessment (EA); follow-up; monitoring*

Introduction

Environmental assessment (EA) is a systematic process that proactively examines the consequences of developmental actions and seeks to improve development by *a-priori* assessment (Arts *et al*. 2001). Section 4(b)(1) of the *Canadian Environmental Assessment Act* (Canada 1992) (*Act)* states as one of the purposes of the *Act* "to encourage responsible authorities to take actions that promote the sustainable development of the environment." Although pre-decision analysis is the focus of EA, it is not sufficient for sound environmental decision-making (Arts *et al.* 2001). That is to say, EA cannot achieve its sustainability objective without a systematic and comprehensive post-project analysis or follow-up program (Wlodarczyk 2000). Follow-up is broadly defined as the collection of activities undertaken during the *post*-decision stages of EA to monitor, evaluate, manage and communicate the environmental outcomes that occur in order to ensure that projects are meeting intended goals and objectives and, more importantly, to provide for feedback and learning[1] for improving environmental management practices (Arts *et al.* 2001).

The need for follow-up in EA is well-documented (Bisset 1980; Culhane *et al.* 1987; Sadler 1987; Arts 1998), and there is a considerable literature on follow-up-related themes, including its rationale, relevance, and methodologies (see, for example, Culhane *et al.* 1987; Tomlinson and Atkinson 1987; Bailey and Hobbs 1990; Canada 1997; Baker and Dobos 2001; Storey and Jones 2003). That said, follow-up has not been satisfactorily implemented in EA practice (Austin 2000; Hui 2000) and has yet to be recognized as an integral part of the EA process (Marshall 2001). Arts *et al.* (2001), for example, describe follow-up as the 'missing link' between EA and sound environmental management.

Given the current state of follow-up practice, we must do a better job of follow-up in respect to improving EA quality. Part of the problem, however, is there has been very little consideration given to the necessary principles to facilitate the development and implementation of EA follow-up programs. This paper presents a number of principles and guidelines to facilitate the development of 'best'-practice EA follow-up. The principles and guidelines are based on lessons learned from recent Canadian EA case studies, and drawn from the EA follow-up literature. First we present a brief summary of the nature and current state-of-practice of EA follow-up, followed by a discussion of several key principles used to design of 'best'-practice follow-up programs.

Environmental Assessment Follow-up

The Canadian Minister of Environment's report to Parliament on the review of the *Canadian Environmental Assessment Act*, "Strengthening Environmental Assessment for Canadians," identifies follow-up as "an essential component of an effective environmental assessment process." In respect to paragraph 20(1)(a) section 38(1) of the Act, the Minister proposes that "where a responsible authority takes a course of action…it shall consider whether a follow-up program for the project is appropriate…and, if so, shall design a follow-up program…and ensure its implementation.”

In recognition of the importance of follow-up activities in ensuring environmental protection and fostering the sustainable development of the environment, and in compliance with the Minister’s recommendations, the Canadian Environmental Assessment Agency’s (CEAA) research and development priorities for 2002-2003 included the need to improve the effectiveness of EA follow-up programs. Under the *Act* (Canada 1992) a “follow-up program” means a program for:

l. verifying the accuracy of the environmental assessment of a project; and
2 determining the effectiveness of any measures taken to mitigate the adverse environmental effects of a project.

Defined in this way, follow-up programs represent part of a much larger process that includes, *ex post* evaluation, auditing and routine monitoring, or quality assurance inspections. When undertaken during the post-decision stages of the EA process, these individual processes help close the loop between impact assessment and impact management. It follows, therefore, that the effectiveness of an EA cannot be established without follow-up; but follow-up is missing or ad hoc in most EA practices (Glasson *et al.* 1994; Austin 2000).

The past thirty-plus years of formal international EA application has provided practitioners and decision-makers with significant feedback experience that has contributed to development of all aspects of the EA process. However, as basic as feedback is to the learning process, there have been constant and consistent messages in the EA literature arguing that follow-up of projects or other actions is rarely done. McCallum (1987: 211) noted that:

> it is now generally believed that environmental impact assessment cannot be expected to endure in society unless follow-up is included. Follow-up provides the systemic feedback needed to make environmental impact assessment relevant to society, and thus have it accepted as the normal way of doing things.

Fifteen years later, Arts *et al.* (2001) noted that while there is a prevailing recognition of the importance of, and the need for, some form of EA follow-up, such follow-up in the post-consent decision stages is performed in only a minority of cases. As Frost (1997) notes in respect to follow-up practice in the UK, significantly more attention seems to be given to EA procedures rather than EA results. We must do a better job of EA follow-up. However, much of the emphasis in recent literature has focused on the development of procedural frameworks which, while important, pay relatively little attention to questions associated with *how* to do good EA follow-up.

Principles for Best-practice

Current research suggests that it is not clear how follow-up should be done and efforts should concentrate around best practice for future follow-up in EA (Storey and Noble 2004). The current lack of regulations, guidelines, standards or procedures regarding the design of follow-up programs; uncertainties regarding the management roles and responsibilities in implementing such programs; and barriers to effective permitting and enforcement of follow-up requirements contribute to the current state of affairs (Wlodarczyk 2000). CEAA recognizes the need to improve the effectiveness of follow-up as this will help in determining:

a. the purpose and objectives of monitoring and follow-up within the context of environmental assessment;
b. when a follow-up program is warranted;
c. the key elements of a follow-up program; and
d. the activities and institutional design characteristics required to support follow-up.

In the following sections we briefly report a number of Canadian case studies (Table 1) and similar experiences from abroad, in an attempt to identify lessons or 'best'-practice principles to facilitate the design and implementation of EA follow-up programs. There is no consensus on what is 'best' practice follow-up. 'Best' simply refers to the best way of doing things, and is both a subjective and dynamic concept. Best practice is essentially about choices –selecting the highest quality options in decisions and applying these using the best techniques available for optimum results (Storey and Noble 2004). The case studies we selected represent unique lessons and experiences from the perspective of EA follow-up. They are all mega-projects representing examples of both best and worst practice. They were identified based on a review of literature, informal discussions with practitioners and researchers, and based on Storey and Noble's (2004) report to the Canadian Environmental Assessment Agency on improving EA follow-up practice in Canada. Due to length restrictions, we provide

Table 1: *Case studies reviewed.*

Project EA	EIS* Year	Location
BHP Ekati diamond mine	1996	Lac de Gras, NWT (300km NE of Yellowknife
Confederation Bridge	1989	Northumberland Strait (NB to PEI)
Hibernia offshore oil development	1985	Bull Arm (Trinity Bay), Newfoundland
La Grande hydroelectric stations	LG-2A 1991 / LG-1 1994	La Grande Riviere, James Bay, Quebec
McArthur River uranium mine	1995	Northern Saskatchewan
Rabbit Lake uranium mine	1987 (resubmitted 1991)	Northern Saskatchewan
Voisey's Bay mine/mill	1997	Northern Labrador, Newfoundland

*EIS = impact statement

only a summary of the key elements of each case study, and the lessons or principles emerging from each.

Legislation that Sufficiently Covers the Scope of Follow-up

Follow-up in Canada is legislated by the *Canadian Environmental Assessment Act* (Canada 1992). Under the *Act* the primary focus of assessment is on the adverse effects of a project or activity on the bio-physical environment. 'Environment,' in the context of the *Act*, means components of the earth including land, water, air, organic and inorganic matter, living organisms and the interacting natural systems of which they are part. This has resulted in most of the energy with respect to follow-up procedures being directed at the biophysical components of project effects (Storey and Noble 2004). However, an 'environmental effect', as defined by the *Act* in terms of a project, any change that the project may cause in the biophysical environment, and any effect of such change on health or socio-economic conditions, physical and cultural heritage, land and resource use, and sites of historical, archaeological, palaeontological or architectural significance (Canada 1992).

In practice, the socio-economic effects of a project may or may not be factors in determining significant environmental effects and related matters such as the need for follow-up programs. This appears to be inconsistent with the stated CEAA view that EA provides an effective means of integrating environmental factors into planning and decision-making processes in a manner that promotes sustainable development (Storey and Noble 2004). While socio-economic impacts are receiving increased attention in EA practice, in only a few cases is there evidence that the broader socio-economic impacts are examined at the same level of detail as bio-physical phenomena. Storey and Noble (2004) argue that an expansion of the scope of follow-up practice is important if EA is to meaningfully contribute to sustainable development practice, and if we are to learn more about the effects of projects on people and how to manage those effects. In most cases follow-up of social issues is rarely required and at best only a few selected economic variables (e.g. employment, local expenditures) are tracked. While this is consistent with current legislation, it means that EAs continue to generate little feedback on the effectiveness of social, economic and other human effects management strategies (Storey and Noble 2004). This is illustrated by the limited scope of the Confederation Bridge EA follow-up program.

Case Study: Confederation Bridge Project

In May 1989 Public Works Canada submitted a Bridge Concept Assessment document for EA review. The proposed project involved the construction of a 13 km bridge over the Northumberland Strait, extending from Cape Tormentine, New Brunswick to Borden, Prince Edward Island. The mandate of the panel reviewing the Bridge Concept was the examination of the environmental and socio-economic effects, both beneficial and harmful, of the proposed bridge concept. There was consensus on the need for an improved transport service between Prince Edward Island and New Brunswick, but the Panel recommended that the risk of harmful effects, particularly concerning possible delay in ice-out, risk of damage to the marine ecosystem, and the displacement of more than 600 Marine Atlantic ferry workers, was such that the project should not proceed.

The panel's recommendation was not accepted by the federal government, and following a 1990 study by an independent Ice Committee the Minister of Environment approved the project based on the Committee's conclusion that the design for the bridge under consideration would meet the Panel's ice-out criteria. Construction began in the fall of 1993 and the Confederation Bridge project was completed in the spring of 1997. An environmental management plan was prepared, including a long-term environmental effects monitoring program. Consistent with the CEAA definition of follow-up and the emphasis on the physical environment, the goals of the monitoring program were to evaluate the effectiveness of environmental protection procedures and to verify predictions regarding the potential biophysical effects of the project. Ice characteristics, for example, were initially documented in 1993, before the bridge was constructed, studied throughout project construction, and monitored after the bridge was complete. Notwithstanding the concern expressed in the initial Panel report over the issue of displacement of ferry workers, there was no formal attempt to follow-up on this or any other potential social or economic effects forecasted in the initial assessment document or raised at the public hearings.

Clear Statement of Follow-up Goals and Objectives

Clarification of the need for, and importance of, follow-up facilitates the carrying out of actions relevant to the achievement of desired ends. An explicit and agreed-upon set of objectives for any follow-up program is fundamental to its success (Glasson *et al.* 1994:169). As Sadar (1999) notes, a viable follow-up program is characterized by a plan, effective process management and a clear rationale for monitoring. Neither was evident in the Hibernia socio-economic environmental effects monitoring (SEEM) program discussed below.

Case Study: Hibernia offshore platform construction project SEEM Program

A proposal submitted to develop the Hibernia offshore oil field, discovered on the Grand Banks of Newfoundland in 1979, was subject to a Panel review under the Canadian Federal Environmental Assessment Review process – a precursor to the current *Canadian Environmental Assessment Act*. Approval for the project was granted in 1986 and construction of a gravity based platform at Bull Arm, Newfoundland, commenced in 1990. As part of project approval and management, the Hibernia Construction Sites Environmental Management Committee (HCSEMC), a socio-economic technical working group comprised of government agency representatives and external advisors, was assigned the responsibility of monitoring the socio-economic effects of the project on local communities and the Hibernia workforce. Monitoring was expected to facilitate the identification and mitigation of negative effects and enhancement of beneficial ones. Four socio-economic components were identified as high priority items for monitoring in the local impact area, namely: business and employment; community services and social infrastructure; housing; public services, commercial and industrial infrastructure.

Data on the four components were to be provided by the proponent and its primary contractors, and various provincial government departments. HSEMC would compile data, circulate monthly reports, and provide an annual summary report of monitoring results and project effects. The first monthly report was produced in June 1992 and the program was terminated in 1996. Over time, reports were increasingly delayed, data for some components were often not available, and some monitoring programs were never implemented.

Overall, the SEEM program added little value to the understanding of project impacts or impact management. The main reason was the failure to clearly establish the objectives of the monitoring program and to identify indicators and threshold values for measuring real project impacts (Storey and Noble 2004). There was little evidence that the information distributed to government departments and agencies or to the public had any utility with respect to verifying EIS predictive accuracy or in managing project impacts (Storey and Noble 2004). Findings from the SEEM program did not result in recommendations for action regarding impact management measures.

Establishment of Pre-project Environmental Baseline

One of the key roles of follow-up is to gain an understanding of project impacts that are not well understood when initial predictions are made. EA predictions are made in an uncertain environment, thus impact predictions of future events are often inexact. The lack of pre-project baseline data perpetuates this situation (Bisset and Tomlinson 1988:124). Baseline information includes the establishment of both the present and future state of the environment, in absence of the project, taking into account changes induced by natural events and other human activities other than the project (Glasson *et al*. 1994:4) and are thus fundamental to predicting likely changes resulting from the proposed development in the ecosystem and surroundings. Recent practice, however, suggests that baseline data are not always available to follow-up impact predictions.

Case study: La Grande hydroelectric and the NWT diamond projects

Determining the baseline condition may require several seasons or years to sufficiently quantify ranges of natural variation and directions and rates of change (Therivel and Morris 2001), and is critical to effective impact monitoring. In the case of the La Grande-2A and La Grande-1 power houses located on the La Grande Riviere, Quebec, a three year program was initiated to establish baseline environmental conditions between 1987 and 1990 (Denis 2000). However, this is perhaps an exception to conventional practice in that baseline monitoring is rarely done nor is it done sufficiently (Storey and Noble, 2004). Time constraints in EIA usually preclude lengthy survey and data collection programs, and impact predictions typically have to rely on existing data. In frontier areas, even existing data can be limited, thereby devaluing the process of verifying the accuracy of impact predictions. In the case of the Ekati Northwest Territories Diamond Project, for example, most biophysical impact predictions and associated mitigation measures in the EIS were based on data collected during just one field season (Mulvihill and Baker 2001).

Maintain Consistency in the Collection of Monitoring Data

Bisset and Tomlinson (1988) identify three key benefits of monitoring. First, monitoring environmental and socio-economic variables can identify potentially negative trends at an early stage. Second, monitoring can be useful to improve knowledge and understanding of the impacts of various projects on specific environmental indicators. Third, monitoring can provide information on the utility, accuracy and comprehensiveness of impact predictions and predictive techniques.

Environmental effects monitoring is undertaken primarily to determine the effects of a project, and secondarily to increase the understanding of cause-effect relationships between the project and environmental change (Wlodarczyk 2000). A fundamental problem, however, as illustrated above by the Ekati experience, is the frequent absence of adequate monitoring data in EA practice. That said, in cases where baseline and project monitoring data are collected, the nature and quality of that data have significant implications for program efficiency, timeliness and credibility (Storey and Noble, 2004). Effective follow-up programs require that data be collected not only in a timely fashion to allow those using the results to make prompt responses to management, but also in a consistent fashion. Experience in Saskatchewan's northern uranium mining resource sector is illustrative of the importance of maintaining consistency in data collection for follow-up.

Case study: Rabbit Lake uranium mining project, Saskatchewan

In 1991, a joint federal-provincial EA Panel was appointed to examine the environmental, health, and socio-economic impacts of uranium mining activities in northern Saskatchewan. Included amongst the projects under review was Cameco's Rabbit Lake mining project, Saskatchewan's oldest operating uranium mining and milling facility.

Contamination of the biophysical environment by radionuclides and heavy metals was a primary concern of both the initial 1987 EIS for the proposed expansion of the Rabbit Lake project, and the 1991 joint federal-provincial Panel review team. In its presentation to the Panel, Cameco noted that it had collected baseline data and monitored the biophysical environment near the mine site since the late 1970s. However, the Panel noted that while monitoring requirements were in place that met regulatory requirements, and data collection was ongoing, there was some concern over the quality of the monitoring data, consistency of methods used to test for radionuclides and trace elements, and the effectiveness of the monitoring program in determining the impacts of mining activities. Monitoring and testing procedures had changed several times throughout the 1980s, and data collected during 1989 and 1990 were discarded due to quality control problems. After more than a decade of biophysical monitoring and data collection, there were few comparable data concerning the effects of radionuclides from mining operations on fish – a valuable social and economic resource base for northern communities.

Focus on 'Actual' Project Effects

Impact prediction is fundamental to EA (Therivel and Morris 2001), and EA itself is designed with the intent to provide information of the changes that will occur in the environment if a particular proposed activity is implemented (De Jongh 1988). However, where outcomes are predicted, numerous studies (Murdock *et al.* 1982; Canter 1983; Culhane *et al.* 1987; Buckley 1991; Locke and Storey 1997) serve to illustrate the difficulties of determining the accuracy of impact predictions. Storey and Noble (2004) suggest that the main source of prediction data are project environmental impact statements (EIS), and these are seen to be deficient insofar as they typically offer:

i) vague, imprecise and untestable statements about potential outcomes, including little indication of when impacts are likely to occur;
ii) non-existent, insufficient, inadequate or inaccessible monitoring data, both pre-project baseline and during project implementation;
iii) obsolete predictions resulting from changes in environmental conditions between the time that the predicted outcome was made and the monitoring activity, or changes in project design, schedules, etc., each of which can affect the relevance of project outcomes.

The net result is that for most assessments the accuracy of only relatively few predictive statements can be determined. For example, Bisset (1984) reviewed EA documents for four development projects in the UK (the Sullom Voe and Flotta oil terminals, Cow Green reservoir and the

Redcar steelworks) for the predicative accuracy of their impact statements. Due to the imprecise and "wooly" language, "accuracy" ranged from 23 percent to 67 percent.

That said, it is not the *predicted* effects, but the *actual* effects that are important (Arts *et al*. 2001). There may be a significant gap between the predicted impacts and the actual impacts of a project. The learning curve and new practice in EA has been greater in terms of the development of impact management approaches than in the development of predictive techniques and methods (Storey and Noble 2004). In this sense it is more important to determine what the *intended* outcomes of the project are and to compare these with *actual* outcomes. As illustrated by the Hibernia socioeconomic impact mitigation program, notwithstanding the inaccuracy of impact predictions, the real negative socioeconomic impacts of project development were avoided.

Case study: Hibernia construction project, socioeconomic impact mitigation

The Hibernia project, described above, was the first of its kind to be developed in Newfoundland. In the absence of experience, many impact predictions, particularly those concerning employment and economic benefits, were unrealistic. For example, employment predictions for 1994, the peak year of construction employment, were under-predicted by 44 percent (Locke and Storey 1997). Similar inaccuracies were evident in related housing demand predictions.

Of particular concern were negative effects of platform construction employment on local communities due to the predicted influx of workers. Considerable attention was given to how the benefits of project development could be captured, while minimizing or avoiding the potentially negative social impacts, particularly the disruption of local communities. After considering experiences elsewhere, and based on consultation with local residents, it was determined that a self-contained work camp designed to feed and house between 1,000 and 1,500 workers at peak construction was the preferred option to avoid the negative social impacts associated with predicted employment increases. The impact assessment only considered the residual social impacts after taking the self-contained work camp into account. Social impacts in the communities near the project were therefore predicted to be minimal. Despite a high demand for labour, previously developed plans to increase work camp capacity - should it be necessary - meant the general objective of minimizing social disruption was achieved.

Hypothesis-driven Approaches to Impact Prediction

Part of the objective of follow-up under the *Act* is to verify the accuracy of impact predictions. Clearly, verifying the accuracy of impact predictions presents a valuable opportunity for scientific research and learning to improve future project impact predictions and predictive techniques. In cases where impact predictions *are* made, there is some suggestion that they should be based on rigorous and falsifiable null hypotheses stating the relevant affected variables, impact magnitude, spatial and temporal extent, probability of occurrence, significance, and associated confidence intervals. Wolf *et al.* (1987) and Ringold *et al.* (1996), for example, suggest that impact predictions should be couched in quantitative terms: specify the exact characteristics to be monitored, identify the spatial and temporal characteristics of interest, and state the Type I and Type II probabilities. This is consistent with recommendations of the Panel reviewing the Voisey's Bay nickel mine-mill project, Newfoundland. In this example, recommendations suggested that an hypotheses-driven approach be adopted for impact prediction and verification (Voisey's Bay Mine and Mill EA Panel 1999). Such was also the approach adopted by the Hibernia biophysical environmental effects monitoring (BEEM) program.

Case study: Hibernia offshore platform construction project BEEM program

The Hibernia Management and Development Corporation, in conjunction with the Hibernia Construction Sites Environmental Management Committee (HCSEMC), established a multi-year (1991-1996) program to monitor the effects of the Hibernia gravity base structure construction site on the marine environment. Survey data on marine variables were collected as part of the EA process that provided both a baseline for subsequent monitoring activity and information for determining various monitoring criteria and variables. The general objectives of the BEEM program included an assessment of the effectiveness of environmental protection and mitigation measures, but also included:

- providing early warning of undesirable change;
- testing impact predictions; and
- assurance that impacts predicted to be insignificant in fact were insignificant (LGL 1993).

For each measured variable an impact (null) hypothesis was developed stating that the impacts of site development and construction activities would not exceed the maximum allowable effects level for that variable.

The findings from subsequent analyses were that all of the null hypotheses developed for the BEEM program could not be rejected. In other words, the construction project did not have impacts on the marine environment beyond acceptable levels.

Institutional Accountability

Commitment and accountability are necessary on the part of proponents and responsible authorities if EA and the project are to achieve intended results. For instance, the results of Hydro-Québec's follow-up program are highly credible due to the quality of the science employed, the fact that the studies were peer reviewed, and that several independent investigations were undertaken (Lascelles 1999). In other cases, such as the Northwest Territories (NWT) Ekati diamond mining project, accountability of the proponent is maintained through an independent environmental monitoring organization.

Case study: Ekati diamond mine project Independent Environmental Monitoring Agency

The Ekati Mine, 300km northeast of Yellowknife in NWT, is Canada's first diamond mine. The proponent, Broken-Hill Proprieties, submitted its assessment documents, and a full Panel review was carried out between 1994 and 1996. The project was approved in 1996, subject to a number of conditions specified in the Environmental Agreement signed by BHP, the Government of the NWT and the Government of Canada, one of which was the creation of an independent 'watchdog', the Independent Environmental Monitoring Agency (IEMA).

The mandate of IEMA is to watch over the mine operator, the regulators, and the various agencies of the Governments of Canada and the NWT. The tasks of the Agency include technical and outreach components such as: reviewing and commenting on management and monitoring plans and their outcomes; bringing forward the concerns of the Aboriginal peoples and the general public; and keeping Aboriginal peoples and the public informed about Agency activities and its findings (Ross 2002). The mandate of the Agency is that of a *review* rather than a *research* organization. As such monitoring for management is the primary focus of its mandate, and finding solutions to environmental management issues arising from the project is a primary objective.

Clarity of Roles and Responsibilities

Government-industry-community cooperation lends credence to the EA and follow-up program. To achieve best practice of EA follow-up, the coordinated roles and responsibilities of government and industry, together with community relationships[2], need to be clearly established in order to contribute to a meaningful, efficient, and informative follow-up program. Responsibilities for follow-up programs require a simple and direct organizational structure, including well-developed communications channels among all interested parties, to ensure that the program work is carried out efficiently. In practice, however, proponents and decision makers face difficult problems because of a system of responsibilities that is fragmentary and lacks clarification and coordination of specific roles for follow-up programs.

Case Study: McArthur River Uranium Project

The McArthur River uranium mining project is located in the Athabasca region of northern Saskatchewan. The ore body was first surveyed in 1984. In 1993 Cameco corporation commenced an underground exploration program and in 1995 submitted an impact statement for Panel review. The Panel noted that the effects of the McArthur River project on northern communities would require long-term monitoring, much longer than recognized in the impact statement. In addition, the impact statement emphasized monitoring of contaminants in air, water, and soil, but mentioned very little of monitoring of broader biophysical effects. The Panel noted that the proposed monitoring program would sample fewer environmental components than do government agencies which currently monitor cumulative effects in the region at points distant from the proposed mine site. The Panel concluded that the monitoring program lacked coordination and that mine operators and government agencies should be cooperating and monitoring the same components.

Conclusion

While there is no consensus on what is 'best'-practice follow-up, based on the current state-of-practice, we must do a better job, particularly with regards to:

- adopting legislation that sufficiently covers the scope of EA follow-up, including biophysical *and* socioeconomic components;
- ensuring a clearer statement of follow-up goals and objectives;

- establishing pre-project environmental baseline data;
- maintaining consistency in monitoring data collection using analytical procedures that are consistent with project impacts over space and time;
- re-focusing EA and follow-up efforts on the real and desired effects and outcomes rather than predicted ones;
- adopting hypotheses or threshold-based approaches when impact predictions are made;
- implementing mechanisms, such as an independent monitoring agency, to ensure institutional and proponent accountability in follow-up actions and reporting; and
- clarifying the roles and responsibilities for follow-up procedures early in the project life cycle.

Given our lengthy history of EA in Canada, there has been significant time for testing and gleaning efficient EA follow-up. However, while considerable attention has been given to procedural frameworks for follow-up practice, there has been very little attention given to how to do good follow-up. The development of best-practice follow-up programs has lagged in comparison to the development of pre-project assessment mechanisms. As a result, follow-up has not been satisfactorily implemented, and has yet to be recognized as an integral part of the EA process. We do have the tools and knowledge to accomplish 'best'-practices, but for the most part the shortcomings of follow-up are due to the limited scope of EA on pre-project impact assessment. If EA follow-up, and therefore the contributions of EA to sustainability, is to advance, then what is required is a re-sourcing of our EA efforts to managing the *real* versus the predicted impacts of project developments.

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Footnotes

[1] Ideally, follow-up and monitoring procedures are a means to incorporate 'double-loop' learning into organizational systems. In other words, emphasis is placed not only on corrective action, but also on adapting underlying values and system behaviors based on feedback results. For a detailed discussion of learning approaches see Diduck (2004).

[2] While community participation in follow-up programs, concerning both identifying follow-up objectives and ongoing data collection, is important to ensure follow-up success, the role of participation and its specific design within the context of EA follow-up deserves attention which is beyond the scope of this particular paper. Its importance, however, is recognized and it is suggested that further process development is required in this regard.