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Cumulative effects assessment

Improving the practice of cumulative effects assessment in Canada

Wanda Baxter, William A Ross and Harry Spaling

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

Keywords: environmental assessment; cumulative effects scoping; professional practice of cumulative effects assesment

Wanda Baxter and William A. Ross (corresponding author) are at Environmental Design, University of Calgary, Calgary, Alberta, Canada, T2N 1N4. Harry Spaling is at The King's University College, 9125 - 50 Street, Edmonton, Alberta, Canada, T6B 2H3.

IN CANADA, ENVIRONMENTAL impact assessments (EIA) of major infrastructure and resource developments now routinely consider the cumulative effects of the project being assessed. Although the advent of cumulative effects assessment (CEA) predates the *Canadian Environmental Assessment Act*, the regulatory requirement to consider cumulative effects has implanted CEA into the EIA process for most major projects (Government of Canada, 1992). While still emerging, the Canadian practice of cumulative effects assessment now has a sufficient track record to evaluate its achievements and identify lessons for improving it in the future.

The purpose of this paper, based substantially on Baxter (2001), is to make recommendations on how to improve the professional practice of CEA based on an evaluation of 12 Canadian cases. The evaluation was carried out using 'best-practice' CEA criteria developed specifically for this research. The 12 cases represent recent CEA practice under the Canadian EIA process and were chosen for regional and sectoral diversity (Table 1). All cases involved comprehensive studies or panel reviews.[1]

The paper first briefly describes the evaluation approach and summarises the evaluation findings; and then recommends several measures to enable more effective CEA practice.

Best-practice criteria and evaluation process

A summary description of the best-practice criteria and evaluation process is provided below. A more detailed description is available elsewhere (Baxter 2001, Baxter *et al* 1999).

The best-practice criteria took the form of eight

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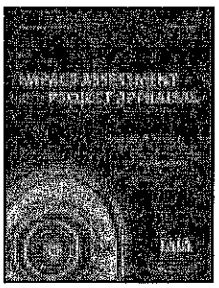

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Wanda Baxter [a] , William A. Ross [a] & Harry Spaling [b]
[a] Environmental Design, University of Calgary, Calgary, Alberta, Canada, T2N 1N4
[b] The King's University College, 9125 - 50 Street, Edmonton, Alberta, Canada, T6B 2H3

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Table 1. Description of projects

Project	Type of EIA	Location & year of EIS	Proponent	Responsible authority
Athabasca seasonal road	Comprehensive	Northern Saskatchewan 1996	Saskatchewan Dept of Transportation	Canadian Coast Guard & Fisheries and Oceans
CFS Debert decommissioning (military base)	Comprehensive	Nova Scotia 1997	National Defense	National Defense
Cheviot coal mine	Joint panel	Western Alberta 1996	Cardinal River Coal Ltd	Fisheries and Oceans
Diavik diamond mines	Comprehensive	Northwest Territories 1999	Diavik Diamond Mines Inc & Aber Diamond Mines Ltd	Indian and Northern Affairs
Halifax lateral pipeline	Comprehensive	1998	Maritimes & North Pipeline Management Ltd	Fisheries and Oceans
Huckleberry copper mine	Comprehensive	1995	Huckleberry Mines Ltd	Fisheries and Oceans
ADM Kahnawake distribution and grain handling terminal	Comprehensive	1997		Indian and Northern Affairs
Keenleyside power plant (hydroelectricity)	Joint panel	1997	Columbia Power Corp & Columbia Basin Trust	Fisheries and Oceans
Muskeg River mine (oil sands)	Joint panel	Northeast Alberta 1998	Shell Canada Ltd.	Alberta Energy and Utilities Board
Musselwhite gold mine	Comprehensive	Northwest Ontario 1995	Place Dome Canada Ltd	Fisheries and Oceans
Newfoundland transhipment terminal (oil terminal)	Comprehensive	Newfoundland 1996	Chevron and Mobil Oil	Fisheries and Oceans
Voisey's Bay mine and mill(nickel mine and processing)	Panel	Labrador 1999	Voisey's Bay Nickel Co	Fisheries and Oceans

questions in three categories — context scoping,[2] analysis and management (see Table 2). These normative criteria were derived from conceptual frameworks developed to guide CEA practice (Hegmann *et al*, 1999; Kingsley, 1997; CEQ, 1997). The three criteria for context scoping emphasise early consideration of explicit ecological and social values used to identify valued environmental components and other past, present and future activities within appropriate spatial and temporal boundaries. Analytical criteria focus on the characterisation and analysis of cumulative effects, and the documented rationale for this understanding. The two management criteria aim to assess the commitment and capacity to mitigate, monitor and manage cumulative effects.

Table 2. Best-practice criteria used to evaluate CEAs

Part 1 Context scoping	1.	Have all other projects & perturbations in the region been identified?
	2.	Does the CEA incorporate applicable ecological and social objectives?
	3.	Are CEA boundaries clearly identified and explained?
Part 2 Analysis	4.	Are potential cumulative impact problems characterised?
	5.	Is a systematic analysis of each identified cumulative impact problem provided?
	6.	Are conclusions supported with a decision trail?
Part 3 Management	7.	Is a responsive mitigation plan provided to avert predicted impacts?
	8.	Is a goal-oriented, environmental management plan provided?

The eight criteria were applied to the formal EIA documentation and readily available supplemental information such as public submissions, government departmental reviews, and other studies produced by affected parties (most often aboriginal and/or environmental-interest groups). Each criterion would be properly met if positive responses were justified. The criteria were used to identify weaknesses and strengths of the assessments.

We made no attempt to query the quality of the analyses of specific valued ecosystem components (VECs) or the adequacy of the methods used; this would require expertise in many areas, and should be dealt with on a case-by-case basis at the level of (government) departmental quality review.

Similarly, determination of significance was not evaluated. This is not because the issue is unimportant. We agree with Sadler (1996), who rates determination of significance as one of the four priorities for improvement of EIA. We ignored it because determination of significance is not different for cumulative effects. To determine the significance of both cumulative and single project effects, thresholds are set and the impacts with these thresholds compared. While the prediction of cumulative impacts differs from the prediction of single project impacts, the choice of the threshold levels is the same.

Overall, we found that provisions for mitigation

(question 7) and environmental management plans (question 8) were relatively strong, while the criteria grouped under the heading 'Analysis' revealed more weakness (questions 4–6). The identification of all other activities and stressors (question 1) and cumulative effects boundaries (question 3) also tended to show weakness.

While such findings indicate the quality of specific aspects of CEA, the criteria were not designed to carry results of one criterion through to influence the findings of the next. The criteria were effective in focusing the evaluation on the main components of CEA, but failed to relate the quality of 'scoping' information to subsequent CEA criteria.

For instance, a CEA may not identify all other activities and stressors acting on the same VECs as the project (question 1), but this inadequacy was not taken into account in evaluating the quality of the environmental management plan (question 8). In practice, inadequate scoping would obviously affect the quality of the environmental management plan and other provisions.

Because information dependencies were not fully acknowledged in our evaluation, CEA mitigation and management plans are likely to be less strong than the findings suggest. This said, the findings do indicate that mitigation and management plans are relatively sound methodologically (if not substantively), while scoping and analysis components are less advanced.[3] Regardless of this fault in the evaluation, the results highlight the importance of effective scoping as the foundation of effective CEA, and the need to acknowledge interrelationships at all stages.

Evaluation findings

Key findings regarding CEA practice show that:

- CEA is indistinct from EIA;
- scoping is inadequate; and
- cumulative effects analysis and follow-up are weak.

These findings are summarised below; others are reported in Baxter (2001) and Baxter *et al* (1999).

CEA indistinct from EIA

In most of the assessments reviewed, the strategy for identifying and analysing cumulative effects is indistinct from the approach for analysing project effects. While the two processes, single project EIA[4] and CEA, are interdependent, they involve distinct considerations and (we submit) should require distinct approaches.

If cumulative effects are treated the same as single project effects, the distinct considerations CEA requires are subverted. For instance, both the identification of all other human activities in the region (question 1), and the characterisation of potential cumulative effects (question 4) are weak in many of the assessments.

In many of the CEA documents, project impacts were determined to be insignificant and, based on that, it appeared that the cumulative effects were left unexamined: this is a fundament flaw in CEA

An exception is the CEA of the Keenleyside Power Plant Project[5] which was guided by a separate terms of reference for the CEA. A series of workshops were held to identify all other human activities in the area, to characterise potential cumulative effects, to identify the VECs on which cumulative effects might arise, and to develop a strategy to analyse potential problems. This approach enabled the identification and evaluation of potential cumulative effects, regardless of whether the project effect was found to be insignificant or not, and the development of a strategy to consider the cumulative stress on affected VECs (stemming from multiple sources).

In many of the other CEA documents, project impacts were determined to be insignificant and, based on that finding, it appeared that the cumulative effects were left unexamined. This is a fundament flaw in CEA.

Effective CEA requires the application of a strategic approach, specifically designed to identify and predict the likelihood and significance of potential cumulative effect problems (CEQ, 1997; Hildebrand and Cannon, 1993). A distinct study strategy for CEA was lacking in many of the cases reviewed. Aspects that we found to be particularly weak were the identification and characterisation of cumulative effects (questions 4 & 5).

Cumulative effects were often only considered within the analysis of project-specific impacts, an approach that undermined the effort to identify linkages and cause-and-effect relationships for the cumulative effects. Thus, cumulative effects were almost always considered too late in the process for strategic analysis. This entirely defeated efforts to assess the total impact on a VEC, system or region.

Hegmann *et al* (1999, page 5) say "the substantive work in a CEA is often done after the initial identification of effects have been completed in an EIA". Also, "all aspects of a CEA are done concurrently with the EIA, resulting in an assessment approach that makes no explicit distinction between the two parts" (Hegmann *et al*, 1999, page 9). We are suggesting that clarification is required to distinguish how and when cumulative effects are best addressed in the EIA. Our findings suggest that the 'two parts' may well require differentiation, particularly with regard to boundary setting and analysis.

Beanlands and Duinker (1983) emphasised that an effective EIA must be guided by a detailed 'study strategy', a recommendation that remains relevant and applies equally to CEA (page 8):

> "A study strategy should incorporate a conceptual outline of the proposed project in an ecological setting, as well as conceptual views of ecological structure and function within the receiving environment ... this conceptualisation would explore the linkages between the project and the VEC, through suspected cause and effect relationships."

The dynamic and complex nature of cumulative effects demands that they be assessed distinctly within the context of ecosystem processes (Davies, 1991; Kingsley, 1997; Slocombe, 1994).

Scoping inadequate

The most pervasive problem we found during our evaluation of the 12 case studies was a lack of early identification of potential cumulative problems. Scoping exercises often did not specifically address cumulative effects.[6] The importance of effective scoping cannot be overstated (CEQ, 1997; Ross, 1998) but the evaluation showed that scoping is a notable weakness of CEA practice, thereby limiting the adequacy of the subsequent analysis.

One recent example of good cumulative effects scoping occurred in the second set of hearings for the Cheviot project. To determine which of the VECs should be considered for assessing cumulative effects, the proponent reviewed the full set and proposed a subset that would, in its opinion, be subject to cumulative effects. This draft list was provided to the environmental assessment panel, which circulated it to all stakeholders and comments were invited. At a subsequent meeting of stakeholders, the panel made the final determination of the list of VECs to be considered in the CEA.

Sometimes the problem results from a flaw in boundary setting. Practitioners may set cumulative effects boundaries on the basis of single-project EIA criteria before considering the contextual information necessary for assessing cumulative effects. EIA scoping exercises employed to identify VECs for the project do not necessarily identify potential cumulative effects arising from multiple projects. CEA boundaries should only be set after contextual information is considered and VECs specific to CEA have been identified. For the most part, temporal boundary setting was also found to be weak. Historical conditions and environmental trends (human-induced or of natural cause) were rarely included properly in the CEA, a deficiency that may diminish the quality of the entire analysis.

Setting boundaries for future impact scenarios was shown to be equally problematic. Much of the problem stems from uncertain guidelines, the product of disagreement among academics, practitioners, proponents and regulators as to how far into the future project-specific CEA must extend. Guidance materials are vague on this issue, and recent court decisions are relied on for clarification of legal requirements (Bruce, 1999).

In contrast to weak boundary-setting, the incorporation of ecological and social objectives (question 2) is explicit in most of the assessments. This is telling because public participation is one of the strengths of Canadian EIA and it is through public consultation that key values and issues are identified, providing pertinent contextual information. In general, public participation appears to be effective, revealing public interest in environmental, especially cumulative, issues, and more recognition on the part of government and developers of the need to consult, respect and work with affected people.

Analysis and follow-up

A lack of supporting analysis for cumulative effects was a problem in all the assessments reviewed. Although there were exceptions (for instance, selective wildlife studies, and acid rock drainage studies), even CEAs that provided analysis did so only for selected VECs. The lack of analysis is probably the product of an inadequate scoping exercise and the resultant inability to identify potential cumulative effects and determine what analysis must be done. In some cases, cumulative effects analysis was provided, but it was difficult to discern where in the documentation cumulative effects were analysed and discussed, what sections dealt with cumulative effects, and what potential cumulative effects were the subject of that analysis.

Overall, not enough analysis for cumulative effects is provided, particularly with regard to future scenarios and predicted outcomes. As a result, mitigation, monitoring and management plans are limited by a lack of information.

Evaluation summary

In sum, the findings of the evaluation suggest that scoping is inadequate and the CEA study approach used to identify and analyse cumulative effects is often inappropriate. The poor results for all aspects of 'Analysis' (questions 4, 5 and 6) are in part due to the factors named above, but also to a lack of scientific rigour and supporting analysis in favour of 'professional judgement'. There is a particular need to differentiate CEA throughout the EIA process. This is a focus of our recommendations.

Recommendations to improve CEA practice

Based on the results of the evaluation, we recommend four actions to improve the professional practice of CEA:

- Include CEA considerations in terms of reference
- Use context scoping
- Use more follow-up studies
- Link project and regional CEA.

Include CEA considerations in terms of reference

The scope and content of CEAs are delineated in a formal terms of reference prepared by a responsible authority. The terms of reference are developed in consultation with affected parties and experts, and serve as the 'instructions' for each assessment. Although it seems obvious that the quality of the terms of reference is directly related to the quality of an assessment, the CEA component of the terms of reference receives inadequate scrutiny. Recent federal terms of reference tend to be based on a standard format that is adjusted according to the specifics of individual projects. It remains to be seen whether using this format will produce improved CEAs.

We believe enhanced attention to the development and content of CEA in the terms of reference will result in higher quality assessments. We found during the course of the evaluation that the terms of reference were used as a template or directive for many of the assessments. Particularly with regard to cumulative effects, the assessment responded directly to the requirements of the terms of reference, and rarely provided information beyond the stipulations of the guidelines.

Further, because the information provided in CEAs specifically meets the requirements of the terms of reference, it is difficult to discern how much of the evaluation actually reflects the quality of CEA practice (or CEA practice capability), and how much reflects the quality of the terms of reference. Associated factors such as the quality and scope of the terms of reference, the competency of government departments to facilitate CEA, and the capacity of government agencies to get proponents to deliver relevant and effective assessments are reflected in the quality of CEAs produced under their influence.

The terms of reference for the Keenleyside Power Plant Project cumulative environmental effects assessment (Fisheries and Oceans Canada, 1996; Mathers, 1996) is a distinct document, building on, but independent from, the EIA terms of reference. The factor that caused the Keenleyside CEA to rank highest in the evaluation, we believe, is the study specifics established in the terms of reference.

Fisheries and Oceans Canada, as the Responsible Authority for the project, provided terms of reference for the CEA based on the format suggested in FEARO (1994). In effect, Fisheries and Oceans used specific CEA theory to guide the practice, reducing the gap between practice and best-practice criteria. In fact, the eight-step procedure suggested in the guide (and adopted for the Keenleyside terms of reference) is consistent with best-practice theory and is specific in its requirements. The eight steps used were (Fisheries and Oceans Canada, 1996):

1. identify project environmental effects relevant to the assessment;
2. identify other projects with effects to which the project would contribute incrementally;
3. identify the geographic scope of the project cumulative effects assessment;
4. identify the temporal scope of the project cumulative effects assessment;
5. analyse the scale of the cumulative environmental effects to determine need for mitigative measures;
6. list mitigation measures that offset cumulative environmental effects;
7. determine the significance of the cumulative effects taking into account mitigation measures; and
8. define a post-construction monitoring program to assess the accuracy of the CEA.

Each step discussed in the Keenleyside CEA terms of reference addresses the context of the project, and specifies activities and information required for the step. More details are provided in Baxter (2001).

The terms of reference requirements for CEA for other projects are generally less informed and specific than this example, suggesting that good terms of reference contribute to ensuring an effective CEA approach. Also, by directly addressing theory and guidelines in the terms of reference, the gap between theory and practice is reduced, and practical expectations are clear.

The Keenleyside CEA terms of reference is the only example we encountered that addresses how the CEA, as distinct from the more general EIA, should be done. We found that assessments that attempt to integrate cumulative effects fully within the single project EIA approach seemed to 'lose' the cumulative effects characterisation and analysis in the discussion of effects' mitigation (and the resultant minor contribution of project effects to cumulative concerns). The issue is: cumulative effects are distinct in nature and behaviour from less persistent single-project effects, and therefore require a distinct conceptual approach; an approach that may be established via effective, specific CEA terms of reference.

Terms of reference are a template for many assessments: particularly with regard to cumulative effects, the assessment responded directly to the requirements of the terms of reference, rarely providing information beyond those stipulations

The recommendation here is that very clear guidance should be given as to what is expected in a CEA terms of reference.[7] This should be an important part of feedback to the proponent early in the process.

Use context scoping

> "[Cumulative effects assessments] are often more involved than assessments of direct impacts. A likely reason that cumulative impacts are not addressed more effectively is that they are not considered early enough in the assessment process" (McCold and Holman, 1995, page 7).

The crux of an effective CEA (as with EIA) is effective scoping. It became apparent in many of the CEAs reviewed that the identification of cumulative effects was hindered by ineffective, or inappropriate scoping. Cumulative effects scoping (or context scoping) is the most important element of an effective CEA. It is essential that CEA is appropriately focused on key issues; otherwise copious amounts of inconsequential information may be gathered, and issues of potential concern may be overlooked.

Generic scoping, focused on the project but not on its context (especially on other human activities in the area), may also result in a lack of information on cumulative effects, the result of leaving the consideration of cumulative effects until late in the assessment process. Attempts to address cumulative effects in the analysis phase are too late in the process to identify VECs for cumulative effects or to determine appropriate boundaries for CEA. Two exceptions in our study, the Muskeg River Mine Project and Keenleyside Power Plant CEAs are based on early and distinct consideration of cumulative effects, both of which achieved the best results for cumulative effects boundary setting, characterisation and analysis.

Guidance manuals for CEA practice, such as Hegmann *et al* (1999), emphasise the importance of identifying potential cumulative effects at the scoping stage, but fail to address how best to 'scope' cumulative effects. It became evident through the course of the evaluation that cumulative effects scoping either was missed entirely, that is, VECs were identified with no reference to cumulative effects, or identification of cumulative effects VECs was an indistinct, random effort.[8]

In many instances, cumulative effects are mentioned in the scoping documentation, but specifics as to how potential cumulative effects have been identified are absent. What is more, it was never clear which VECs may be affected by potential cumulative effects. As a result, it seems impossible that cumulative effects analysis is based on sufficient, focused information, having failed in the scoping stage to provide the information needed to determine appropriate boundaries and an analysis strategy. Potential cumulative effects that are named are not described, and information on their potential composition, behaviour and interactions is not provided. In other words, scoping exercises that are not specifically designed to identify and characterise potential cumulative problems are not likely to provide the depth of information that CEA requires.

Effective characterisation of the cumulative effects to be assessed is essential to bounding the assessment, carrying out appropriate analysis, and designing effective mitigation and monitoring plans. The evaluation findings show that scoping for cumulative effects is a primary weakness of Canadian CEAs. Cumulative effects scoping has been practised as though 'scoping is scoping, period', as if cumulative effects require no special treatment in this regard.

The US Environmental Protection Agency (1999) advises that "the assessment of cumulative impacts is not substantially different from the assessment of direct or indirect impacts", but the authors later outline the unique considerations CEA involves (for instance, whether the environment has been previously degraded, and what are the trends for activities in the area). While such guidelines are useful, there has been little guidance as to how the specific, more involved issues of CEA can be 'scoped' via traditional scoping methods. We propose that scoping for cumulative effects *does* require unique considerations, and that a more specified approach is required.

Our proposed method for scoping cumulative effects (that is, context scoping) is presented here as a recommendation for the improvement of CEA practice. With improved cumulative effects scoping, CEAs will be focused on the analysis of impacts on potentially affected VECs, and a strategy for studying each potential cumulative effect can be developed at an early stage. Ultimately, context scoping will clarify how and when to identify potential cumulative effects and issues of regional concern, and will set the stage for improved CEA quality overall. Additionally, the proposed context scoping method may help to reduce the amount of confusion and argument that CEA tends to elicit.

Context scoping (called this to denote the importance of contextual issues for scoping potential cumulative problems) is not that different from traditional scoping exercises. However, the approach is designed to consider cumulative effects *specifically*, according to the broader range of considerations CEA entails. In particular, the end product of traditional scoping is a general, comprehensive set of VECs. Some of them may have been identified in relation to possible cumulative effects, but VECs specific to cumulative effects are not distinguished from the full range of VECs.

Thus the focus of CEA is blurred from the start. It is difficult to comprehend how boundaries for cumulative effects analysis are set and VECs are determined before other stressors in the region and potential interactions are considered. It is equally

problematic that in many cases cumulative effects analysis occurs late in the EIA process, thereby suppressing the consideration of potential cumulative problems. Determining the significance of cumulative effects cannot rely solely on the significance determinations for project environmental effects. When it does, effects that are determined insignificant are not carried through to the CEA, although it is recognised that effects that are determined insignificant may still contribute to significant cumulative effects (Ross, 1998).

Context scoping is proposed as a method to distinguish VECs specific to CEA in a 'secondary' scoping phase. In this phase, contextual issues relevant to the VECs identified in the primary scoping phase (or traditional scoping) are investigated, and the full range of primary VECs is reduced, according to the likelihood they will be affected by cumulative impacts.

In other words, context scoping is a second phase that screens all the VECs identified in the initial scoping phase for their potential to be subject to cumulative effects. The VECs that are not likely to be affected by cumulative effects are screened *out*, reducing the number of VECs for cumulative effects analysis, while at the same time focusing the CEA on key issues.

It is important to distinguish single project effects from cumulative effects at the scoping stage. This 'separation' allows the different analysis required for project effects and cumulative effects to be carried out separately, but in parallel. The results of both analyses are combined to inform mitigation and management plans as a single, comprehensive plan.

It should be noted that, although analysis will be undertaken separately for project effects and cumulative effects, ongoing information sharing is a necessary part of the two-fold process, particularly with regard to baseline data gathering and findings of significant impact. The approach to context scoping is illustrated in Figure 1.

Use more follow-up studies

The two essential factors that a CEA must provide are: sufficient information on how the project may contribute to cumulative effects; and how the proponent proposes to avoid potential cumulative effects problems. Although most of our recommendations address improving the provision of sufficient information, such information must be followed with the implementation of mitigation, monitoring, and environmental management plans. Further, many CEAs rely heavily on mitigation to determine that there is no significant impact, although the recommended mitigation measure may not have precedent for

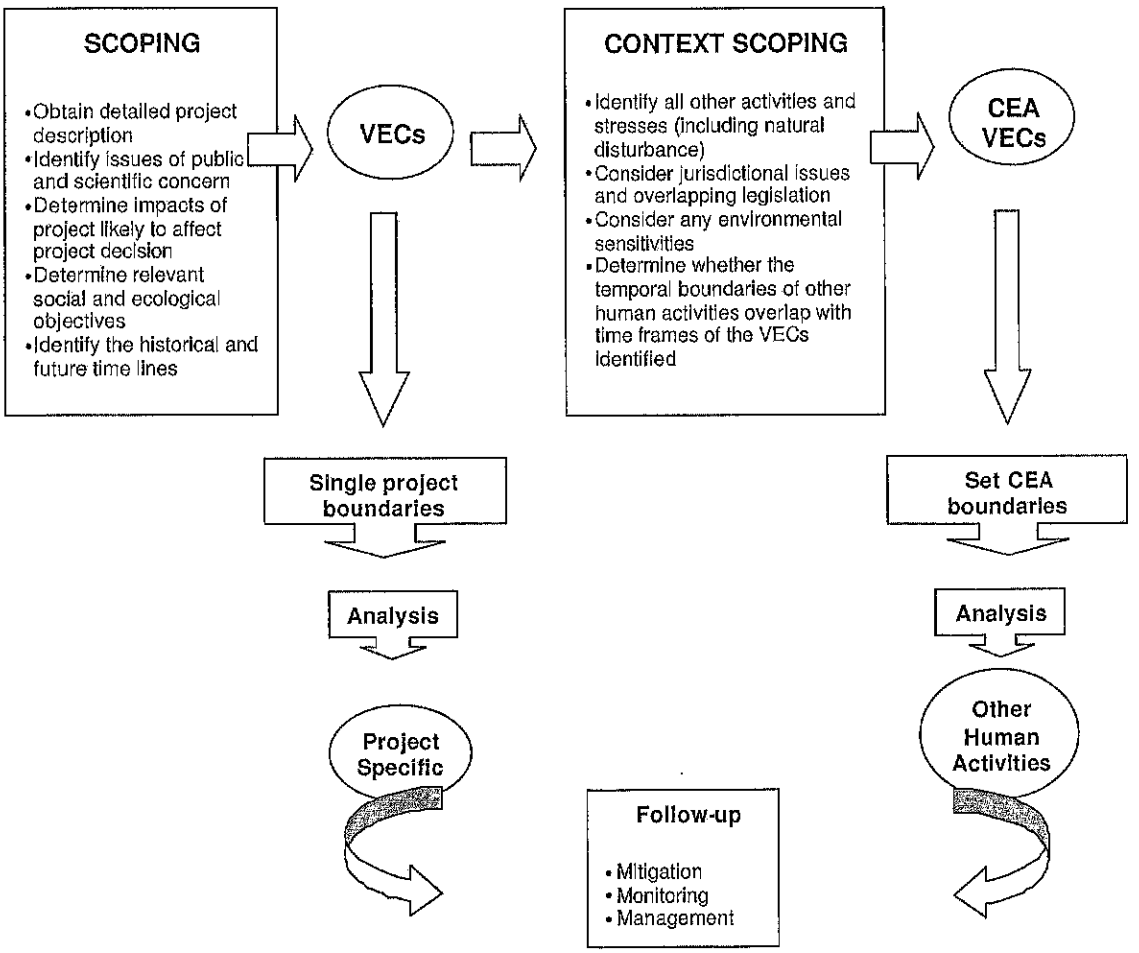

Figure 1. Approach to context scoping

success,, and may or may not be implemented (particularly if the proponent is not the only party named as responsible to carry out the plan).

The conclusions of EIAs are project decisions often based on the condition that mitigation, monitoring and management plans will be carried out effectively. To do less, or require less, is to devalue the EIA process, and to reduce the quality of EIA by tolerating follow-up neglect.

In sum, the improvement of CEA depends on a commitment to implement follow-up provisions.The actual quality of CEA will not be revealed until it is apparent whether or not it has 'made a difference' (Sadler, 1996), when the project is affecting the environment. The effectiveness of mitigation measures and the assurance that such preventative actions are taken will determine the effectiveness of CEA.

Similarly, monitoring and environmental management plans are essential to identify and manage effects over time. Without formal commitments to ensure both the efficacy and implementation of these measures, even the best CEAs (on paper) are limited by uncertainty, and the quality of the assessment may be something entirely different from what happens on the ground.

In the case of CEA, uncertainty is a considerable factor, and adaptive environmental management is often depended on to respond to exaggerated, unforeseen and/or accidental negative changes to the affected environment. There are two major complications with dependency on adaptive management in the case of CEA. The first is that CEA predictions are more complex and thus less certain than are single project predictions. The second limitation results from the nature of cumulative effects, deriving from multiple sources and affecting multiple VECs, thus incurring added uncertainty. The result is uncertainty not only from the project itself, but also from all other activities and stressors affecting the same VECs as the project.

We advocated that cumulative effects be managed using an adaptive management approach (Baxter *et al*, 1999), but we also argue for emphasis on prevention, rather than just adaptation. For effective management of cumulative effects, we suggest that adaptive management should be relied on only when it is likely to be effective. This will require that follow-up plans be in place. Beyond that, application of the precautionary principle would be wise.

The first indicator of a need for precaution is the lack of follow-up commitments and infrastructure to support effective monitoring and management programs (the cornerstone of adaptive management).We recommend more use of follow-up studies designed to manage cumulative impacts effectively. These should be used even when cumulative effects are less important, but can be essential when there is a need to manage cumulative impacts that threaten specific VECs or the ecological integrity of an environmental system.

Link CEA at both project and regional levels

> "The [Alberta Energy and Utilities] Board believes an industry led multi-stakeholder approach could be effective in addressing the regional environmental issues that originate from different projects ... The Cumulative Effects Management Initiative, as this process came to be known, is still, however, under design ... The Board is becoming increasingly concerned that these processes may not be moving forward at a speed sufficient to meet the Board's regulatory requirements to ensure that energy developments are carried out in an orderly and efficient manner that protects the public interest." (AEUB 1999, page 39)

Two approaches to CEA have been suggested. One holds that future scenarios are beyond the responsibility of project CEA and that cumulative effects management can be left to a regional approach (Bennet, 1994). The other approach maintains that individual projects must forecast the long-term implications of the project's contribution to future conditions in order to uphold the precautionary principle and act preventatively (Cooper and Canter, 1997; Canter and Cooper, 1997).

In some sense, both approaches are necessary for effective assessment and management of cumulative effects. However, the first approach appears to us to fail to deal properly with cumulative effects assessment. A regional approach can set the context needed for scoping, assessing and managing cumulative effects attributable to individual projects, whereas project-specific CEAs should build on the regional understanding and suggest in some detail how to manage the cumulative effects in order to make a decision about the specific project.

We observed that important cumulative issues were not investigated in some projects, claiming that a regional approach was needed to assess cumulative impacts. While project-specific CEAs may not be, in and of themselves, adequate to deal with all cumulative effects from multiple impact sources, this is no excuse for avoiding rigorous CEA of projects (Slocombe, 1994, Spaling *et al*, 2000). The development of approaches to doing regional CEA is still in its

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infancy and regional CEAs are no substitute for assessment and management of cumulative effects at the project level. The best-practice criteria require that cumulative effects be fully assessed in the project-specific CEA.

Conclusion

> "The EIS is a product of the EIA process and, as such, the quality of the documentation is likely to be closely associated with the quality of the process." (Fuller, 1999)

We found the quality of CEA in Canada to be less than satisfactory overall. A key problem appeared to be a significant gap between 'best-practice' theory, on which the criteria were based, and CEA practice, the substance of the evaluation. The criteria were designed to serve as a measure of the ideal, the 'best practice', against which the assessments were compared. One of the reasons for the discrepancy, we believe, is the quality of guidance concerning CEA expectations available to practitioners.

It is not clear to us, and to practitioners with whom we have discussed this matter, what CEA legislative requirements mean in practical terms.[9] More recently, new guides have been made available (for instance, CEQ, 1997; Hegmann *et al*, 1999; Kingsley, 1997). Whether such guidance will be sufficient to improve practice is yet to be determined. However, we believe that some CEA deficiencies evident in recent cases may be caused as much by cryptic requirements and uncertain guidance as by incapable practice (Sadar *et al*, 1995).

Thus, CEA practice may be improved by addressing external influences as well as methodological and practical issues, in an attempt to address the gap between theory and practice. Two external factors we consider to be vital are quality feedback from public agencies and CEA training.

In Canada, the federal agency responsible for administering the EIA process is the Canadian Environmental Assessment Agency. Other agencies play similar roles for the provincial, territorial and aboriginal EIA processes. These agencies must ensure that EIA (in our context, CEA) meets the regulatory and administrative requirements of relevant legislation. For this to occur, a formal, co-ordinated process of quality control is imperative toward the improvement of CEA, and the EIA agencies must be capable of managing this essential exercise. This will require more resources and more CEA expertise than the agencies now possess.

Public regulators should both help proponents (and their consultants) to conduct excellent CEA and provide corrective feedback to encourage good work and discourage poor work. The main point is that, if agencies really expect high quality CEA, they must reward those who perform exemplary CEA (for instance, compliment the work publicly) and send negative signals (such as rejecting the EIA documents as unsatisfactory) to those who conduct inadequate CEA.

We believe this would be effective because the reputations of EIA consultants would be enhanced or degraded by such feedback. Proponents would start to ask themselves "if we can't afford to do EIA right the first time, how can we afford to do it again?". Proponents would be persuaded to seek out those consultants with consistent records in performing high-quality CEA. This would also increase confidence in the regulatory review process and should help minimise legal appeals and delays.

The CEAs we reviewed lacked consistency and cohesion. The main problem seems to be a lack of appropriate training and capable CEA practitioners and managers. There is a pressing need for both education and training programs to foster specialists capable of integrating EIA and CEA and ensuring a consistently high standard of CEA practice. Government personnel and panel members (widely used in Canadian EIA processes) also require CEA training.

This training must be comprehensive, including knowledge of CEA theory (conceptual frameworks), understanding of CEA terms of reference, and familiarity with context scoping and follow-up studies in CEA. Such training is critical for public agencies to provide constructive feedback and guidance to improve the standard of CEA practice. The government probably does not employ sufficient numbers of experienced EIA and CEA practitioners, and the need to recruit and retain capable assessment officers is urgent.

Similarly, members of affected communities may be unable to express concern about cumulative effects because the terms and concepts of CEA remain widely unknown. In sum, CEA education at all levels of involvement is necessary and the goal should be to 'demystify' the process. Demystifying CEA will require that the Canadian Environmental Assessment Agency works with universities and other educational institutions, community groups and government departments to disseminate and solicit information that is easily understood and accessible.

We conclude that consistently high-quality feedback from public agencies and concerted CEA training, combined with improvements in the CEA process as recommended above, will improve the practice of cumulative effects assessment considerably. We are in the midst of far-reaching social and political change, and the ever-increasing role of CEA is part of that change. CEA in the future will not be an obscure, uncertain practice; it will simply be the way we do things — we will have to. The time to improve the 'art' of CEA is now.

Notes

1. Federal EIA legislation specifies four types of EIA: screening, mediation, comprehensive study and panel review.

Major projects are usually assessed by a comprehensive study or panel review. In cases of overlapping jurisdiction (federal and provincial), a joint panel review may be conducted.

2. In Baxter *et al* (1999), "context scoping" was identified as "suitability study". This has been renamed "context scoping" to describe more aptly the CEA components it addresses, and in response to a need for more focused cumulative effects scoping (discussed further in later sections).
3. This may be because Canadian EIAs have focused on mitigating impacts through environmental management plans. However, managing cumulative impacts can be much more difficult than managing project impacts.
4. Following Ross (1998), we use the term "single project EIA" to refer to the concept of doing an EIA for a project without any reference to cumulative effects from other activities, that is, assessing only the effects of the project under review.
5. Throughout this paper, we observe that the Keenleyside and Muskeg River projects have performed 'better' than the others. This is because cumulative effects were considered early in the process. In this way, boundaries were set explicitly in consideration of the cumulative effects, not just in consideration of project effects. Other assessments appear to have developed their approaches before considering cumulative effects.
6. The Canadian Commissioner of the Environment and Sustainable Development (1998) reinforced this conclusion. It reported: "that 48 of 159 assessments indicated that cumulative environmental effects had been considered. In most of those assessments, however, there was little evidence to indicate the nature of the cumulative effects assessment, including whether there had been an analysis of the ecosystem and its stressors".
7. This guidance is specific to the project being reviewed and thus, is above and beyond that provided in the cumulative effects guides noted earlier (for instance, Hegmann *et al*, 1999; Kingsley, 1997).
8. McCold and Holman (1995) found similar results in their review of 89 American environmental impact statements. Only 35 statements even mentioned cumulative impacts, 13 reported that cumulative impacts were insignificant but provided no analysis, and few identified other sources of impact.
9. The Canadian Environmental Assessment Act, for example, requires (Government of Canada, 1992):

> "16. (1) Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:
>
> (a) the environmental effects of the project, ... and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
>
> (b) the significance of the effects referred to in paragraph (a); ..."

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