Significance Criteria and Determination in Sustainability-Based Environmental Impact Assessment

(Final Report)

Prepared for

Mackenzie Gas Project Joint Review Panel

Prepared by

David Lawrence
Lawrence Environmental

November 30, 2005

1. Introduction

This report provides an overview of environmental impact assessment (EIA) significance determination approaches and methods. It has particular regard to sustainability-based assessment. It is intended to assist the members and staff of the Joint Review Panel (JRP) for the Mackenzie Gas Project (MGP), together with parties to the review of the MGP, in assessing the significance of project-related impacts, and in considering impact trade-offs as they relate to the determination of net impact benefits.

The Environmental Impact Statement (EIS) for the MGP has been submitted by Imperial Oil Resources Ventures Limited, a subsidiary of Imperial Oil, the Mackenzie Valley Aboriginal Pipeline Limited Partnership, ConocoPhillips Canada (North) Limited, ExxonMobil Canada Properties, and Shell Canada Limited. The project purpose is to develop three onshore natural gas fields (anchor fields) in the Mackenzie Delta at Niglintgak, Taglu and Parsons Lake and to transport natural gas and natural gas liquids (NGLs) by pipeline to market. The JRP has commenced consideration of the EIS for the MGP. It is now seeking specialist advice on the matter of significance criteria and determination to inform the public hearing phase of the review.

This report establishes a context for the analysis (in Section 2) by defining impact significance, by identifying why significance determinations are necessary and what they seek to achieve, by highlighting significance determination properties, by outlining how significance determinations are made in EIAs, and by indicating the current status of impact significance determination in EIA practice. The report next (in Section 3) describes the characteristics, specific methods, and positive and negative tendencies of three general significance determination approaches. Good and poor impact significance determination practices, associated with each approach, are identified. Various composite and support methods, together with good general impact significance determination practices, also are described. Section 4 addresses how impact significance determination practices change for cumulative as compared with individual impacts, for socio-economic as compared with bio-physical impacts, when the Precautionary Principle is integrated into the process, and when sustainability contributions drive the EIA process and related impact significance determinations. Section 5 presents overall conclusions and suggested future directions. Key references are identified. Tables are consolidated in Appendix A.

This report was prepared by David P. Lawrence, PhD of Lawrence Environmental for the Mackenzie Gas Project Joint Review Panel. Funding for the report preparation was provided by the Canadian Environment Assessment Agency (CEAA). The views, conclusions and recommendations expressed herein are solely those of the author, and do not represent the views of the Joint Review Panel or of CEAA.

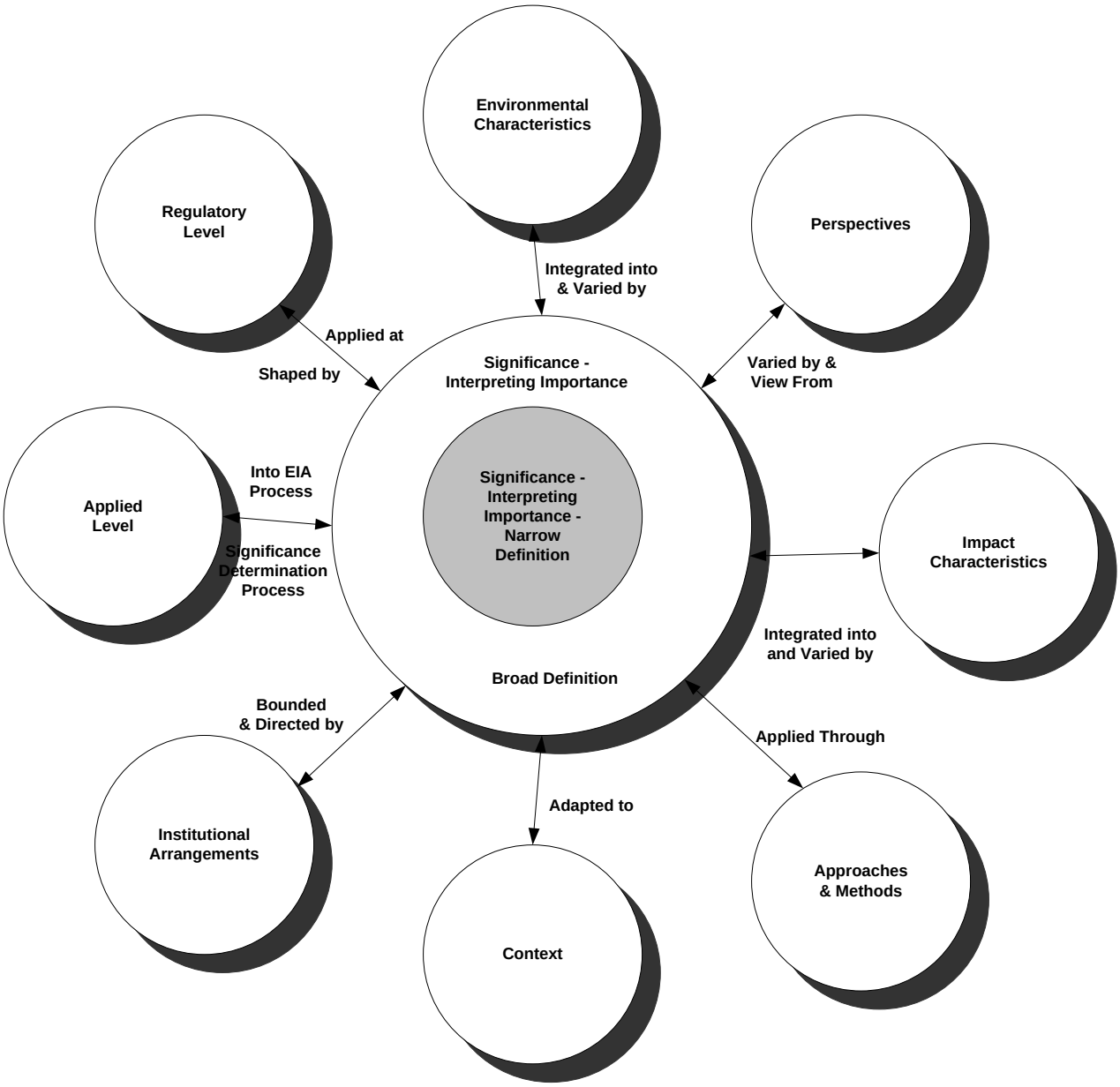
2. Context

2.1 What is Impact Significance?

Significance determination in EIA practice makes judgements about what is important, desirable or acceptable. It also interprets degrees of importance. Such judgements, as highlighted in Figure 1, and as described below:

- *Focus* on relevance to EIA decision-making (e.g., which projects to consider? what is an acceptable impact? which impacts require mitigation?);
- Consider the *interplay* between *impact* characteristics (e.g., magnitude, duration, frequency, spatial distribution, reversibility, positive or negative, likelihood, direct / indirect or cumulative) and the characteristics of the *receiving environment (*e.g., environmental significance, sensitivity, resilience, scarcity, stability, capacity);
- Vary by *context* (e.g., spatial – global, national, regional and local, temporal – short term, long term and other past, current and future actions, physical, ecological, social, cultural, economic and political conditions, relative to background conditions). Linking significance interpretations to context makes it easier to address such matters as scarcity, scale, reversibility, thresholds, sensitivity and cumulative effects.
- Are structured and partially determined *by institutional arrangements*. What represents a significant impact is bounded and influenced by EIA legislation, regulations, guidelines and legal precedents, and by government policies, plans, standards and objectives regarding, for example, the environment, land use, resources and sustainability.
- Vary depending on *perspective* (e.g., legal or institutional recognition, political or public recognition, professionally judged to be important) (Canter, 1996; FEARO, 1985). Significance perspectives also can vary among individuals, groups, communities and sectors of societies.
- Take place at both the *regulatory* level (e.g., varying requirements for different proposals and for various environmental and effect types, impact significance objectives, principles, thresholds, criteria and procedures in legislation, regulations and guidelines, project acceptance or rejection, judicial review and interpretation), and at the *applied* level (e.g., key issues during scoping, the ranking of criteria for evaluating alternatives, what represents valued ecological and socio-economic components, when mitigation is warranted, when a project is unacceptable, when monitoring is warranted);
- Apply *procedures* (e.g., staged evaluation procedures, community involvement and shared decision-making procedures) and/or *methods* (e.g., threshold application, the scaling of criteria, quantitative aggregation) to determine impact significance;
- Can be defined *narrowly* (e.g., only adverse impacts, only indirect social and economic effects, statistical significance only, only as defined in EIA legislation and regulations, only when contravenes government policies or standards, only as determined by the EIA team); and

Figure 1 - Defining Impact Significance



- Can be defined *broadly* (e.g., positive and negative impacts, direct and indirect social and economic effects, all forms of significance, interpretations from multiple perspectives including what people consider important).

2.2 Why Are Impact Significance Determinations Necessary?

EIA practice can never be fully comprehensive. It is always possible to address more potential impacts, interactions and alternatives over a wider area, for a longer time period, and to a greater level of detail. With no "stopping rule" value-laden judgements must be made and substantiated regarding what should and should not be examined, and to what level of detail. Also, systematic, explicit, open and thoughtfully supported significance judgements help to ensure that:

- The value-basis for decisions is explicit;
- Resources are allocated efficiently and effectively;
- The many uncertainties associated with value judgements and the prediction of future conditions are effectively managed;
- Comparable situations are treated in a comparable manner;
- A sound technical / scientific basis for decision-making is provided;
- Community knowledge, concerns, attitudes, values, perceptions and preferences are effectively integrated into decision-making; and
- Proposed actions and EIA processes and outcomes are consistent with and supportive of government policies, plans, standards, objectives and priorities.

In addition, surveys of EIA effectiveness point to marginal to poor performance levels in determining significance in technical guidelines, in impact evaluation, and in specifying the significance of residual impacts (Sadler, 1996). Thus significance determination is not only necessary in EIA practice but there is considerable room for improvement in how impact significance determination is conducted.

2.3 What Do Impact Significance Determinations Seek to Achieve?

Significance determination in EIA practice, if properly undertaken, should identify and seek to achieve both procedural (how significance determinations are made) and substantive (outcomes from significance determinations) objectives. Examples of procedural objectives for significance determinations include:

- *Focused and Efficient*. Significance determination procedures should concentrate efforts and resources on matters critical and relevant to decision-making, consistent with regulatory requirements and public and agency concerns (Barrow, 2000).
- *Explicit and Clear*. The value basis for judgements, the roles of all parties in the process, and the basis for the assumptions and procedures employed should be readily understandable.
- *Logical and Substantiated.* All parties should be able to follow how the reasoning process supports the significance judgements. The judgements and the data, analyses, perspectives and knowledge that inform the judgements should be directly linked.

- *Systematic and Traceable*. A coherent and orderly procedure should integrate impact characteristics, environmental characteristics, contextual factors, institutional requirements and objectives, and the perspectives and concerns of interested and affected parties. Other parties should be able to independently reconstruct how judgements were derived from inputs.
- *Appropriate*. The judgements should reflect an appreciation of and sensitivity to the context (e.g., local and regional setting).
- *Consistent*. Comparable situations should be treated in a comparable manner.
- *Open and Inclusive*. The significance judgement procedures should be conducive to understanding and participation by all interested and affected parties.
- *Collective and Collaborative* – Interested and affected parties should jointly determine what is and is not important and why.
- *Effective*. Outcomes from the significance determination procedure should help realize public policy substantive and procedural objectives and priorities.
- *Adaptable*. The significance determination approach should be able to readily adapt to uncertainties and changing circumstances.

No significance determination approach or method can fully achieve the preceding objectives. Which objectives receive the most and least attention is itself a significance judgement. These objectives can help identify and assess the positive and negative tendencies of alternative significant determination approaches.

Examples of substantive significance determination objectives include:
- Regulatory compliance and policy consistency;
- The avoidance and reduction of potentially significant negative impacts, to the extent practical;
- The avoidance and reduction of all negative impacts, to the extent practical;
- The reduction of all adverse impacts considered potentially significant, as defined by significance thresholds;
- Net positive impacts (benefits outweigh negative impacts);
- The public interest (public a net beneficiary);
- The greatest good for the greatest number (utilitarianism);
- The greatest good for the least advantaged (distributional equity);
- Local and regional benefits exceed adverse local and regional impacts, risks and costs (local and regional communities and environment net beneficiaries);
- Issue resolution or management (major points of contention resolved or ameliorated to acceptable levels);
- Consensus among major parties (major parties or stakeholders can reach an accommodation on major points of disagreement);
- Net benefits to the environment;
- Sustainability (contributes to rather than inhibits sustainability); and
- Combinations of the above.

Reasoned EIA arguments are not always clear or consistent regarding which substantive objectives are being applied when determining impact significance. Such inconsistencies

or lack of clarity can inhibit communications among parties, reduce understanding of documents, undermine the credibility of parties and documents, and lower the potential for resolving conflicts and / or building consensus. The consistent and clear application of substantive objectives for significance determination can be problematic if there are fundamental differences among parties regarding which substantive objective or objectives should determine when an impact is or is not significant. Decisions regarding which substantive objectives are to guide significance determinations, therefore, should be made early in the EIA process (e.g., during scoping). Such decisions also should be explicit, substantiated and collaborative.

2.4 What Are The Major Properties of Significance Determination?

There are certain inherent properties associated with impact significance judgements in EIA practice. Each property has implications for how significance determination procedures can and should be conducted. Significance determinations, for example:

- *Are Subjective, Normative and Value-Dependent* – This suggests that significance determinations must be substantiated. It demonstrates that significance determinations should not be the exclusive prerogative of "experts" or "specialists". Care should be taken to avoid implicit or explicit biases, and to make explicit the value-basis of interpretations and assumptions (Beckwith, 2000).
- *Are Imprecise*. People rarely order their values with precision in the abstract. Values, perceptions, attitudes, positions and worldviews are difficult to measure with precision, often vary greatly from group to group, and can change dramatically over time, in an unpredictable manner (Vanclay, 1999). Aggregating values across impacts and disciplines can be especially problematic (Lawrence, 1993). Ample allowance should be made for uncertainties, and for the role of intangibles.
- *Vary among EIA Activities*. The meaning of significance and the appropriate choice of significance determination procedures can vary when applied, for example, during scoping, option screening and comparison, environmental characteristic interpretation, impact interpretation, cumulative effects assessment, and impact monitoring (Kjellerup, 1999). The procedures employed should reflect the unique characteristics of each activity.
- *Vary for Different Types of Effects and Environments*. This illustrates the need, for example, to appreciate the differences between socio-economic and bio-physical environments and effects, and their associated implications for significance determination.
- *Are Context-Dependent*. A thorough understanding of contextual factors (e.g., local ecological, social and cultural conditions, judgements in related decision-making areas) likely to influence significance judgements is essential (Sadler, 1996; Sippe, 1999).
- *Are Political and often Controversial*. They are closely connected to decision-making and, therefore, allocate power (Beanlands and Duinker, 1983; Prichard, 1993). The role of significance determinations in, for example, fostering or inhibiting the participation of various parties in exercising influence and power in decision-making should be considered. It also is desirable to understand, explore and, where practical,

resolve controversies associated with conflicting perspectives about what is important (Gilpin, 1995).

- *Are Not The Same As Magnitude of Change*. Magnitude of change is a factor in determining impact importance (Westman, 1985). Magnitude of change is more amenable, especially for physical and biological concerns, to objective, quantitative procedures. Once magnitude of change is combined with other more value-based and subjective considerations (e.g., context, level of public concern), significance determinations become more subjective. Significance determination procedures should not be limited to impact magnitude considerations. It should not be assumed that they exhibit the same characteristics as impact prediction methods.
- *Involve a Process*. Impact significance determination procedures rarely simply label an impact as significant or insignificant, with or without a reason. Usually a series of steps or stages are involved (e.g., re-interpreting significance after considering mitigation potential and likelihood). Such processes systematically integrate all relevant knowledge and perspectives.
- *Are Collective*. Significant determinations are subjective and value-full. Impact significance interpretations also vary among individuals, groups, communities, and sectors of society (Hildén, 1997). Deciding what is important is necessarily a joint, preferably collaborative, endeavour where all EIA team members participate, as do interested and affected parties.
- *Are Complex and Difficult*. Significance determination procedures integrate facts, knowledge, values and perspectives (UNEP, 2002). They are multi-dimensional. They encompass both the objective and the subjective (i.e., a science and an art) (Morgan, 1998; Wood and Becker, 2004). The meaning of significance evolves and changes as knowledge progresses and as attitudes alter (Barrow, 1997). Context assumes a pivotal role. The act of deciding what is important tends to be controversial. It is prone to bias (e.g., technical perspective, driven by non-Aboriginal society values) (Larcombe, 2000). It often is closely associated with social and political conflicts, some of which may be based on deeply held values that reflect cultural, historical and social norms (Hildén, 1997). Opinions vary greatly regarding the appropriate approach or mix of approaches and methods for determining significance. The importance of impacts can change dramatically during implementation because of prediction and management uncertainties. Accordingly, significance determination approach should be carefully constructed and substantiated, open, adaptable and inclusive. Lessons and insights from similar projects and environments can be especially helpful.

2.5 How Is Impact Significance Determination Conducted?

Significance determinations vary among EIA process activities (Lawrence, 2002). Some key importance judgements associated with various EIA activities include:

- *Screening* – Determining if and which EIA requirements should be applied to the proposed action, and which criteria and procedures to apply when making screening decisions;

- *Scoping* – Deciding which agency and public issues, alternatives, major proposal and environmental components, and analysis boundaries will guide and structure the EIA process;
- *Baseline Analysis* – Determining valued ecological and socio-economic components and interactions;
- *Proposal Characteristics* – Identifying those proposal characteristics most likely to induce significant impacts and most likely to warrant mitigation and monitoring;
- *Alternatives Analysis* – Determining the appropriate criteria and evaluation procedures, and selecting the reasonable, acceptable and preferred options;
- *Impact Identification* – Determining which impacts to assess, establishing temporal and spatial boundaries, and determining the appropriate level of detail;
- *Impact Prediction* – Determining appropriate impact prediction methods and selecting impact intensity criteria and scaling levels (e.g., magnitude, duration, frequency, spatial extent);
- *Impact Interpretation* – Selecting the appropriate impact interpretation approaches and methods, and determining the acceptability and importance of individual and cumulative effects, with and without mitigation and/or enhancement;
- *Impact Management* – Deciding when impact management is warranted, selecting the appropriate measures, and deciding when and if management measures are effective;
- *Consultation* – Identifying major issues and key stakeholders, deciding on the roles of each party in the process, and selecting and adapting appropriate consultation measures;
- *Documentation* - Determining what rationale should be provided for interpretations, assumptions, conclusions, recommendations and decisions; and
- *Decision-making* – Deciding if there is a sufficient decision-making basis, and determining if the proposal action is acceptable (with or without conditions), and selecting the appropriate conditions.

Each of the preceding interpretations involves value-based, subjective judgements. Each requires substantiation. The choice of appropriate procedures and methods for each judgement will vary depending on the characteristics of the activity (Ross and Thompson, 1992).

The characteristics of impact significance determination processes vary considerably, depending on the approach and methods selected. However, four general characteristics commonly exhibited in many significance determination procedures include:

- *Staged* - Impact significance determination procedures tend to proceed from clear thresholds to comparative criteria, from the legal to the non-legal, from the quantitative to the qualitative, from the absolute to the relative, from pre-defined external standards to context-specific judgements, from individual to cumulative to sustainability impacts, and from professional judgements to public concerns (Canter, 1996). Significance-related considerations that can be most readily applied tend to be applied first. Sequence of application is not a reflection of importance. Also, the process should not stop (e.g., only important if tied to public policy and if can be quantified) when the issues associated with making significance determinations become more subjective and complex.

- *Iterative* – Impact significance determination procedures tend to be iterative and discursive (Holden, 1999). This characteristic reflects the need to progressively explore and integrate significance determination criteria and considerations, to introduce and apply the perspectives and knowledge of multiple stakeholders, to address the implications of mitigation and enhancement measures, to identify and manage uncertainties, and to adapt to changing circumstances.
- *Internal and External Involvement* – Impact significance determination procedures generally provide for involvement and review by relevant experts (both within and external to the EIA team), by public and private organizations, and by interested and affected individuals, groups, communities and sectors of society (Sadler, 1996). The nature and extent of involvement varies among approaches.
- *Internal and External Support* – A variety of methods and procedures are commonly applied to support the significance determination process with technical and community data, knowledge, experience, concerns and preferences.

2.6 What Is the Status of Impact Significance Determination in EIA Practice?

Impact significance determination is widely recognized as a vital and critical EIA activity. At the Federal level in Canada, for example, whether a project is likely to cause significant adverse environmental is the central test in the Canadian Environmental Assessment Act (CEAA, 1993). Although generally acknowledged as pivotal to EIA practice, significance determination remains one of the most complex and least understood of EIA activities (Wood and Becker, 2004).

The treatment of impact significance determination is highly variable at both the regulatory and applied levels. At the regulatory level some jurisdictions (e.g., Australia, California) include very detailed requirements concerning which impacts are significant, and how impact significance thresholds and criteria are to be established and applied. Other jurisdictions (e.g., Canada) require that impact significance interpretations be addressed, provide a general sense of which impact types tend to be more important, and then offer general guidance (e.g., sample criteria and stages). Canada defines significance determination quite narrowly (e.g., adverse effects only, only indirect social and economic impacts). Several provinces and territories (e.g., the Yukon and Northwest Territories, Ontario, Newfoundland/ Labrador, Saskatchewan) define significance more broadly (e.g., direct social and economic effects included). Recent judicial and panel decisions in Canada have attached greater importance to the purposes of EIA legislation (e.g., sustainability). This has broadened the definition of what represents a significant impact (e.g., positive and negative, direct and indirect, individual and cumulative bio-physical and socio-economic effects). Increasing attention is being devoted to interconnections among effects and to formulating indicators for applying significance criteria (Environment Canada, 2003).

EIA practice at the applied level, regarding impact significance determination, also is highly variable. Many significance determination procedures and criteria are available from EIA literature and are evident, to varying degrees, in EIA documents. Some variability can be attributed to contextual and value differences (Canter and Canty, 1993).

The state-of-practice, based on practitioner surveys, suggests that there is considerable room for improvement (Sadler, 1996). EIA quality and effectiveness analyses, EIA literature, EIA case studies, and sponsored applied research (e.g., significance has been a CEAA research priority for several years) have begun to gradually and tentatively (appreciating the importance of contextual adjustments) establish a body of "good practices." But many deficiencies and dilemmas remain.

Examples of common criticisms of prevailing impact significance determination requirements and practices include:

- Confusion around the concept of significance (e.g., equating magnitude and significance) (Hildén, 1997);
- Insufficient consideration of the significance of social and economic effects, and a failure to appreciate the implications for significance determination of the differences between socio-economic and bio-physical impacts (Lawrence, 2004);
- Insufficient consideration of the significance of positive, indirect, interdisciplinary, cumulative and sustainability effects;
- Tendency to be driven by non-Aboriginal society global and national values in contrast to local and regional Aboriginal values. Also, decisions concerning significance commonly fail to benefit from traditional knowledge or from consultation with Aboriginal people, and often fail to determine the significance of effects on Aboriginal culture, economy, health, social structure, and on Treaty and Aboriginal rights (Larcombe, 2000);
- The general failure to identify significance thresholds or standards which, if not adequately mitigated, would lead to proposal rejection (Kjellerup, 1999);
- A tendency by assessors to rely on their own judgements regarding impact significance rather than integrating the values of people (Morgan, 1998);
- An implicit and sometimes explicit bias toward the technical, the quantitative, and the positivistic at the expense of qualitative reasoning, contextual analysis, and public knowledge and perspectives (Burdge, 2002);
- A failure to recognize the political dimension of significance determination (Boothroyd, 1998);
- A failure to acknowledge or to systematically address the uncertainties associated with significance determinations;
- A tendency to defer significance judgements to decision-makers. Such decisions can, in turn, be made in an arbitrary and implicit manner, uninformed by either technical analyses or by stakeholder perspectives and positions (Sadler, 1996).
- Insufficient systematic attention to insights from practice (e.g., which significance determination procedures and methods work well and which do not under various conditions);
- Technical and political resistance to significance determination procedures where the public assumes more than an advisory or review role in deciding what is important and why (e.g., various forms of shared or delegated decision-making); and
- A gulf between the available methods and procedures and the current state of much of EIA practice in significance determination (Sadler, 1996).

Many ascribed limitations can be ameliorated with better practice. But deep divisions are likely to remain regarding such matters as whether impact significance should be broadly or narrowly defined, what should be the appropriate roles for specialists, for the public, for government agencies, and for courts and review panels in significance determination, how best to design and blend methods and procedures, what represents the appropriate level of detail for regulatory requirements, guidelines and good practice standards, and how best to make contextual adjustments. This diversity of perspectives suggests a far from settled EIA sub-field. Clear and unequivocal good practice significance determination standards are unlikely to emerge in the foreseeable future. Given the importance of context, the central role of values and subjectivity, and the many complexities, conflicting perspectives and uncertainties inherent in significance determinations, such standards are unlikely to be possible or appropriate. Nevertheless, there remains considerable potential for better and more consistent (when conditions are comparable) EIA practice in impact significance determination, especially in avoiding and minimizing recurrent pitfalls and poor practices.

3. Approaches and Methods

3.1 The Technical Approach

The technical approach to determining impact significance starts from the premise that ascertaining what is more or less important is best undertaken by breaking the question into its constituent parts, and then by applying a technical procedure to progressively aggregate relevant impact significance determination considerations. Such procedures are viewed as providing a scientific and technically sound decision-making basis. The value of consistency, transparency, and ability to replicate is stressed.

Heavy reliance is place on expert and technical data, analyses and knowledge. EIA specialists, working closely with other members of the EIA team, assume the lead role. Provision is often made for external (e.g., political representatives, government agencies, members of the public) input and review. Both impacts and the environment are viewed as capable of subdivision. Aggregation is by means of qualitative and /or quantitative procedures. It tends to be assumed that preferences can be ordered in the abstract and remain reasonably constant. Quantitative aggregation procedures are often favoured because they are considered more consistent and objective.

The technical approach, at the regulatory level, can take the form of political representatives, government staff and the public jointly defining matters of national, provincial or territorial significance. These priorities are incorporated into EIA legislation. Staff then, with consultant advice and public input, define, in greater detail, significance thresholds for matters of area-wide significance. These requirements are incorporated into EIA regulations. Alternatively, EIA requirements can focus on the roles of significance determinations in EIA decision-making (e.g., which requirements to apply, when mitigation is warranted, when more detailed assessment is required). Generic guidelines are prepared for applying the thresholds and / or criteria. These guidelines describe procedures for collecting, analyzing and interpreting data, for assessing if

thresholds are likely to be exceeded, for selecting and applying various classes of criteria, before and after mitigation, for managing uncertainties, and for involving the public and politicians. Often generic significance determination guidelines are further refined and adapted by government officials, and built directly into project-specific requirements and guidelines. Sometimes these requirements and guidelines will identify those potentially significant impacts and / or valued socio-economic and bio-physical components that should receive particular attention.

Technical impact significance determination at the applied level operates within the context of regulatory significance determination requirements. The point of departure tends to be criteria. The most basic procedures simply list criteria, sometimes in the form of questions or checklists. Progressively greater levels of precision can involve significance thresholds for individual criteria, scaling levels (e.g., major, moderate, minor, no significance), clearly defined boundaries for scaling levels, quantitative boundaries for scaling levels, qualitative decision rules for combining scaled criteria, quantitative decision rules for combining scaled criteria, statistical significance tests, and the use of procedures for addressing uncertainties (e.g., sensitivity tests, fuzzy set analysis).

The basic building blocks of technical impact significance determination procedures are thresholds (a clearly defined performance level that explicitly establishes significance) and criteria (which explicitly and consistently differentiate the factors contributing to significance determination judgements) (Sippe, 1999). There are numerous threshold types. Examples include:

- Legal thresholds (e.g., regulatory standards will be contravened, likely to conflict with public policies, plans, guidelines, criteria or objectives);
- Project characteristics thresholds (e.g., high level of resource or energy consumption or waste generation, activity inherently causes significant effects);
- Environmental characteristics thresholds (e.g., receptors are highly sensitive or significant, resources or features are very scarce or unique);
- System function thresholds (e.g., likely to disrupt the functioning of ecological, resource, social or economic systems, carrying capacity jeopardized, establishes a precedent for future actions with significant effects);
- Impact intensity thresholds (e.g., magnitude, duration, or frequency of effect is great relative to ambient conditions);
- Impact characteristics thresholds (e.g., permanent or irreversible effects, trans-boundary effects likely, potential human health risks, major inequities in the distribution of effects are likely, high degree of uncertainty regarding impact magnitude and distribution, high cumulative effects potential); and
- Preference thresholds – contrary to community norms or regional norms, likely a high level of public controversy, reflects preferences of individuals, groups or organizations).

A criterion is a comparative mechanism that facilitates assessment and judgement. There are both generic (e.g., positive / negative, degree of intensity, spatial extent, frequency, duration, reversibility, likelihood, direct/indirect, cumulative effects potential) and

feature-specific (e.g., linked to specific setting types, locations, limits and impacts) criteria. Criteria can be subdivided by discipline. In some cases distinctions are drawn among impact magnitude, receptor significance and impact importance criteria.

Threshold and criteria application can occur before and after considering mitigation potential. Often a second iteration addresses cumulative effects. Sometimes the sequence progresses from the less to the more complex, from prescribed to discretionary, from quantitative to qualitative, and from individual to cumulative (e.g., 1. public policy – legislative, regulatory, standards, guidelines, 2. individual quantitative, 3. individual qualitative, 4. cumulative quantitative, 5. cumulative qualitative). Some procedures only proceed through the initial steps (e.g., only legal, individual and quantitative). Technical impact significance determination proponents favour thresholds and criteria where there is a minimum of ambiguity (e.g., quantified boundaries), and where thresholds can be clearly defined and consistently applied (i.e., which require a minimum of interpretation). This reduces the potential for bias and speculation in decision-making. Procedures for integrating contextual factors and stakeholder perspectives are less well developed.

Examples of specific technical significance determination methods include:

- Impact thresholds and criteria defined at the regulatory level (i.e., significant if anticipated impact levels not in compliance with government laws, policies, plans, standards, and objectives);
- Environmental or resource sensitivity, quality or significance thresholds or criteria (e.g., significant if likely to adversely affect a pre-defined valued ecosystem component, as identified by public institutions, interest groups or technical specialists) (GLL, 2001);
- Sustainability thresholds and criteria (e.g., application of sustainability principles, criteria and indicators to determine significance);
- Statistical significance testing – testing of the impact ratio with confidence intervals (applied when major changes in the environment can be predicted; isolates human-induced changes from natural variation; a common approach in monitoring to assess the significance of differences over time and place) (McBride et.al., 1993);
- Generic impact magnitude, environmental, or importance thresholds or criteria;
- Location or project specific thresholds or criteria;
- Simple rating systems (e.g., low, moderate, high), with or without generic definitions for each level;
- Qualitative aggregation procedures (e.g., decision rules for combining impact /environment / importance ratings);
- Quantitative aggregation procedures (e.g., multi-criteria analysis methods for combining criteria scores with or without criteria weightings, concordance analysis, goals achievement analysis, hierarchical decision analysis, paired comparison analysis);
- Tiered or staged evaluation procedures (e.g., decision trees, checklists, questionnaires, matrices);
- Uncertainty management procedures (e.g., fuzzy set theory, testing with alternative assumptions and scenarios) (Marusich, 2001; Wood and Becker, 2004); and

- Combinations of methods to address variations in measurement levels, disciplinary differences, and level of uncertainty difference.

Examples of positive and negative tendencies associated with the technical significance determination approach are presented in Table A-1. The range of technical methods available means that these positive and negative tendencies are present to varying degrees with different methods. The more quantitative and technically complex procedures, for example, tend to be more consistent, traceable and explicit but weaker in facilitating community involvement and avoiding technical biases. More qualitative procedures are more adaptable and are more amenable to community involvement and the integration of community knowledge. But they are often more inconsistent and less explicit. Composite technical procedures mix qualitative and quantitative criteria and methods to match the procedures and criteria to various classes of environmental and impact characteristics. Methods and refinements also can offset and minimize negative tendencies, and reinforce positive tendencies. Table A-2 presents examples of good and poor practices associated with the technical significance determination approach. Good practices should be adapted to the context. Poor practices should be avoided and minimized, to the extent practical.

The technical approach can, if effective and appropriate (to context), systematically, explicitly and consistently integrate technical, scientific and community analysis and knowledge into individual and cumulative impact significance determinations. It can focus on key decision-making factors, effectively integrate regulatory standards and policies, and make helpful distinctions regarding such matters as impact magnitude, receptor sensitivity, the distribution of effects over time and space, and the degree and nature of uncertainties. A technical significance determination approach should distinguish between thresholds and degrees of significance, ensure that thresholds, criteria and methods are fully defined, substantiated and appropriate to the situation, effectively integrate public and agency concerns and preferences, fully consider the implications of uncertainties and of impact management potential, and concentrate on major proposal-related issues and impacts, and valued socio-economic and ecological components and interactions.

Care should be taken not to exclude or marginalize the public, ignore or undervalue community knowledge and interests, apply methods inappropriate to the situation, inhibit dialogue and negotiation among interested and affected parties or constrain innovation and adaptation. Professional judgements and technical methods (e.g., matrices, quantitative aggregation procedures) are decision aids not decisions. Clear and substantiated reasons for significance judgements still need to be provided – reasons that draw upon both technical and non-technical procedures, and view significance from multiple perspectives. Technical methods and scientific knowledge about impact magnitude characteristics, although usually necessary, do not provide a sufficient basis for impact significance determination. Active involvement by interested and affected parties remains essential. This is especially the case when interpreting potential social and economic impacts (See Section 4.2).

Too frequently technical significance determination procedures in EIA practice are characterized by crude tables that fail to fully capture relevant distinctions, by unsubstantiated judgements, by the exclusion of public perspectives, and by insufficient attention to the implications of uncertainties. These potential deficiencies are all avoidable with good practices. Less readily avoidable is the often subtle bias in favour of the technical, the scientific and the quantitative and against the qualitative, the non-technical and the non-scientific. Insights from the collaborative approach (Section 3.2) can ameliorate this potential bias.

3.2 The Collaborative Approach

The collaborative impact significance approach starts from the premise that subjective, value-based judgements about what is important should result from interactions among interested and affected parties. EIA specialists make no generic pre-judgements (e.g., thresholds and / or criteria) prior to public involvement. Instead the public (or more properly a heterogeneous collection of publics, each with separate agendas, concerns and perspectives) fully participate in either deriving the thresholds and criteria, and / or in directly interpreting the significance of issues of concern and potential impacts. Context is fully integrated into significance determinations.

The collaborative significance determination approach presupposes an interactive, collective, continuous involvement decision-making model. The parties jointly determine what is acceptable and unacceptable, important and unimportant, and how much importance to attach to any given concern or potential impact (i.e., degrees of significance). Ideally the parties reach a consensus on significance determinations. Substantiation is provided by recording the joint reasoning of the parties as they make impact significance judgements. Technical analysis can assist the process. But technical involvement is at the discretion of the parties to the process. The process can be aided by third parties (e.g., conciliators, facilitators, mediators).

The approach presumes that preferences regarding importance are fluid, value-full and context-dependent. Joint interactive decisions regarding what is important are not constrained by artificial categories of environmental components and impacts. Instead a holistic view tends to be adopted of the environment and of patterns of direct and indirect impacts. The approach assumes that it is neither possible nor appropriate to order value preferences with precision in the abstract. Significance determination is open, transparent, inclusive and participative (Couch, 2000). The process encompasses all interested and affected parties. It is highly dependent on effective public participation.

Significance determination is approached from multiple perspectives. The integration of a diversity of perspectives and values is essential, especially those of potentially affected individuals, groups and communities. Collaborative significance determination approaches seek to balance interests and perspectives. They often use measures to ensure that all parties can fully participate. Compatibility with local visions and objectives is often stressed. The process is characterized by effective two-way communications, mutual learning and negotiations. It should be conducive to identifying and

accommodating conflicts, and to enhancing the level of control that local people have in deciding what is important. Both significant public issues and impacts are evaluated. Collaborative significance determination is characterized by bottom-up (individuals / groups / communities to governments and proponent) and inside-out (community to external parties) decision-making.

The collaborative approach at the regulatory level focuses on facilitating and encouraging the direct and ongoing involvement of interested and affected parties in impact significance determination. Pre-judgements regarding potentially significant impacts are tightly circumscribed (e.g., instances where widely accepted and supported public standards and policies are likely to be contravened). Government agencies are sensitive to regional and local conditions and issues when applying policies and standards. Considerable discretion is left at the project / local level for decisions regarding which impacts and uncertainties merit more or less attention. A key government role is facilitating the involvement of the most directly affected and most vulnerable groups and individuals (e.g., through participant funding). Regulatory and project-specific requirements emphasize the need for proponents to demonstrate and document how they involved interested and affected parties in significance determinations. Public issues, concerns and preferences should be documented, together with where and how they are addressed in the EIA. If they are not addressed reasons should be provided. EIA guidelines encourage two-way interaction, and more frequent and continuous forms of public involvement in significance-related decision-making.

The collaborative approach at the applied level generally involves an inner circle of stakeholder representatives who participate in intensive and ongoing involvement forums and an outer circle of interests and constituents who participate by means of a host of consultation methods. The role of the public in these interactive forums can be advisory, full partner (i.e., shared decision-making) or decision-maker (i.e., delegated decision-making). This open and iterative process parallels and is closely connected to the EIA process. The procedure identifies, analyzes, interprets and manages issues and tradeoffs. Any impact or issue, identified by an affected party as important, is considered worthy of assessment. Significance, from each stakeholder's perspective, is assessed. Systematic and explicit procedures identify, track and respond to public comments and suggestions. Social /psychological issues are considered real and important rather than misconceptions to be ignored or countered. Steps are taken to offset procedural and substantive inequities, and to ensure that a single point of view or special interest does not dominate the process. Care is taken not to create unrealistic expectations about what a proponent can deliver. Much effort is exerted to build trust and to maintain credibility. Creating and maintaining effective links with the broader public is critical.

Collaborative significance determination procedures assume multiple forms (See Table A-3). Numerous methods are available to facilitate the functioning of the interactive core of the collaborative significance determination approach (See Table A-3). Many consultation methods are available for forging effective links with the broader public(s) (See Table A-3). These methods help ensure that community perspectives and knowledge concerning potentially significant impacts are fully integrated into the process. They also

can provide a “sounding board” for interpretations and judgements reached through the more interactive forms of participation.

Collaborative significance determination methods exhibit both positive and negative tendencies, as indicated on Table A-4. The collaborative significance determination methods exhibit both positive and negative tendencies. Positive tendencies can be reinforced. Negative tendencies can be minimized. Table A-5 provides examples of good and poor practices for designing and applying collaborative significance determination methods. Good practices should be adapted to the context. Poor practices should be avoided and minimized.

The collaborative approach interprets significance openly and inclusively. It can facilitate public understanding and involvement, integrate community and traditional knowledge, build community credibility, trust and support, contribute to dialogue, mutual learning and creative problem-solving, and foster local and regional empowerment and democratic decision-making. The public and elected representatives and local and community perspectives and aspirations are central to rather than at the periphery of impact significance determinations. The collaborative approach tends to focus on value-based tradeoffs, effectively integrate equity-related concerns, and reflect the subjective, qualitative and uncertain nature of significance determination.

Multiple methods are available for structuring a collaborative procedure, facilitating and supporting the process, and establishing and maintaining links to the broader public. Collaborative significance determination approaches, when effectively designed and managed, are adapted to the needs and characteristics of each public, fully integrate community, traditional and technical knowledge, actively correct and resolve misinformation and misunderstandings, balance interests and perspectives, offset procedural inequities, focus on local and regional issues, tradeoffs and aspirations from multiple perspectives, and fully document the rationale for all joint interpretations and conclusions.

Some negative tendencies are sometimes associated with the collaborative significance determination approach. Complex issues are sometimes oversimplified. The demands on those participating in ongoing interactive forums can be very onerous, which can, in turn, result in high turnover and a lack of continuity. The reasons for interpretations can be difficult to trace, and occasionally reflect incomplete or incorrect information. Committee members are not always representative of broader constituencies. Occasionally a few aggressive individuals dominate proceedings. Major public issues are not always the same as major, potential impacts. Sometimes, in the face of controversy and major value conflicts, consensus is not always the most environmentally sound outcome. In some cases insufficient consideration is given to available technical and scientific analysis and knowledge or to national or international needs and perspectives. It is possible to guard against and offset these negative tendencies by using and adapting good practices, by avoiding poor practices, and by selectively drawing upon other approaches (see Sections 3.1 and 3.3).

3.3 The Reasoned Argumentation Approach

Reasoned argumentation is evident in some aspects of EIA and in many fields related to EIA. The systematic testing and refuting of alternative hypotheses is central to natural and social science theory building. There are numerous ongoing debates regarding the appropriate applied roles of the natural sciences, and a variety of conflicting and overlapping social science models, theories and frameworks. The social sciences are characterized by discursive and critical argumentation. Consequently, reasoned critical debate and discourse are very evident in SIA literature and practice (Burdge and Vanclay, 1996). Varying perspectives also surround alternative EIA processes (Lawrence, 2003). Debate, in the form of the systematic and rational exploration of choices, was for many years the core approach in planning and administration. Numerous other approaches and models have emerged over the past three decades. These are usually presented as alternatives to or variations of the rational model. There also is a long tradition of reasoned argumentation in judicial and panel decisions.

As is evident from the above, rational argumentation is a major element of the conceptual foundation of EIA. What has received less attention is how this tradition is and should be expressed in judgements regarding impact significance. The reasoned argument approach to significance determination is usually expressed qualitatively, although it can incorporate quantitative data and analyses. It views significance determination as making reasoned judgements, supported by evidence. It is evident in all EIA documents, despite a propensity to cloak subjective reasoning in “objective” scientific and technical language. The reasoned arguments concerning significance tend to be more explicit in summary documents intended for public review and comment.

The reasoned argumentation approach starts from the premise that both technical and public approaches are too narrow to provide an adequate foundation for value-based significance judgements about what is and is not important. The technical approach is viewed as pre-occupied with technical analysis and quantification, at the expense of community perspectives and knowledge. The public approach is viewed as too quickly equating public concerns and issues with impact significance, at the expense of other sources of insight and knowledge. Arguably, the reasoned argumentation approach has the potential to integrate technical and community knowledge, facts and values, multiple perspectives, and both the qualitative and the quantitative information into a form (a reasoned, comprehensive and fully substantiated written and/ or oral argument) that all parties can contribute to, understand and respond to.

At the regulatory level, reasoned argumentation is evident in how governments identify substantive and procedural priorities in the preambles, objectives and sometimes body of EIA legislation and regulations (e.g., human health effects, sustainability). EIA guidelines sometimes expand on the rationale for these “matters of significance”. Often such concerns are singled out as part of the screening process, as triggers for EIA legislation, or in differentiating among EIA requirements. They also are expressed by government agencies during scoping, in project-specific requirements, and in recommendations for approval, approval with conditions, or rejection. Often monitoring

conditions also reflect government interpretations of what is more and less important. In each case governments generally make a qualitative written argument in favour of what they consider important.

The reasoned argumentation approach to significance determination is expressed at the applied level in the staged procedures that use relevant data, knowledge, analyses, perspectives and preferences to focus (on what is important), to interpret (whether and to what degree important), and to reach conclusions for each decision in the process. It is present in EIA documents in the document structure, in the values applied to evaluate choices and impacts, and in how relevant inputs are linked, synthesized and summarized in support of interpretations and conclusions. Summary EIA documents and sections generally focus on matters considered especially significant. Panel or court decisions tend to follow a structured reasoning process. Such decisions sift through a vast amount of potentially relevant information, perspectives and values, focus on matters critical to decision-making, and progressively build reasoned arguments in support of each judgement, consistent with regulatory requirements.

Multiple methods construct and apply reasoned argumentation to support significance determinations. A reasoned argument, in support of significance determinations can, for example, be structured by:

- Decision-making choices (e.g., reasonable alternatives, preferred alternatives, mitigation measures);
- Impact type or discipline (e.g., displacement, proximity disruption, community, social, ecological);
- Project characteristics (e.g., construction, operations, closure, access corridor);
- Issues (as raised by interested and affected individuals, groups, communities, and agencies);
- Perspectives (stakeholder values and interest-based);
- Study areas (e.g., local, regional, territorial, national, international);
- Time horizons (e.g., short term, long term, future generations);
- System types (e.g., ecological, social, political, economic); and
- Combinations of the above.

How an argument is structured may influence its outcome in terms of what is considered significant and why. It may, therefore, be prudent to incorporate several of the above distinctions when structuring significance determinations. Sensitivity analyses to test the decision-making implications of alternative structuring approaches can be useful. The explicit or implicit substantive objectives (see Section 2.3) that guide the reasoned argumentation process for significance determination also can lead to varying conclusions regarding what is important and why. This underscores the need for early and preferably collaborative (jointly with interested and affected parties) impact significance determinations.

Reasoned arguments regarding impact significance, can be written (e.g., EIA documents, briefs and submissions, panel reports) or oral (e.g., testimony, presentations, hearings, stories, dialogue, bargaining). They can be limited to text. They can use decision aids

(e.g., figures, tables, matrices, network diagrams, qualitative and quantitative methods, consultation procedures). Such decision aids are not a substitute for reasoned argumentation. It is still necessary to distil from these materials the reasons that support significance judgements. Moreover, as noted in Sections 2.3 and 2.4, because significance judgements are, or should generally be, collective the reasoned argumentation process should either directly involve all interested and affected parties and / or should systematically draw upon the concerns, knowledge, values, and preferences of interested and affected parties. This means a broadly-based and very effective public and agency involvement process. It also suggests that impact significance determination is not a technical task undertaken exclusively by "experts."

The reasoned argumentation impact significance determination approach exhibits both positive and negative tendencies, as indicated on Table A-6. As with the other two approaches positive tendencies can be reinforced and negative tendencies can be offset. Table A-7 provides examples of good and poor practices for the reasoned argumentation significance determination approach. Good practices should be adapted to context. Poor practices should be avoided and minimized.

The reasoned argumentation approach provides a basis for judgements that all parties (proponents, government, technical specialists, community groups, Aboriginal peoples, affected individuals) are familiar with and can readily understand and contribute to. It can effectively blend the technical and the non-technical, the subjective and the objective, and the qualitative and the quantitative. It is conducive to contextual adaptation, to exploring value-based choices from multiple perspectives, to integrating community and technical knowledge, to incorporating oral and written arguments, to drawing upon technical decision aids, and to interpreting the importance of both individual and cumulative impacts. It can provide a sound, explicit, focused and traceable foundation for decision-making. The output from this approach is the systematic and written substantiation of interpretations of importance – an outcome ultimately required for summary EIA documents and, where applicable, for panel decisions.

A succinct and plausible set of reasons for importance judgements does not mean that sufficient consideration has been given to technical, scientific, community and traditional analysis and knowledge, or to multiple and varying perspectives, values, beliefs and interests. The policies and perspectives of government agencies may or may not be adequately considered. Lessons from comparable situations and contextual characteristics may or may not be adequately addressed. The implications of uncertainties can be thoroughly explored or alternatively they can be arbitrarily dismissed or ignored. Sometimes data and arguments are used selectively to support predefined positions (i.e., advocacy or bias). It can be difficult to identify inconsistencies in qualitative written, reasoning procedures. These potential drawbacks underscore the importance, when applying the reasoned argumentation approach to significance determination, of integrating elements of both the technical (Section 3.1) and collaborative (Section 3.2) approaches.

3.4 General and Composite Approaches

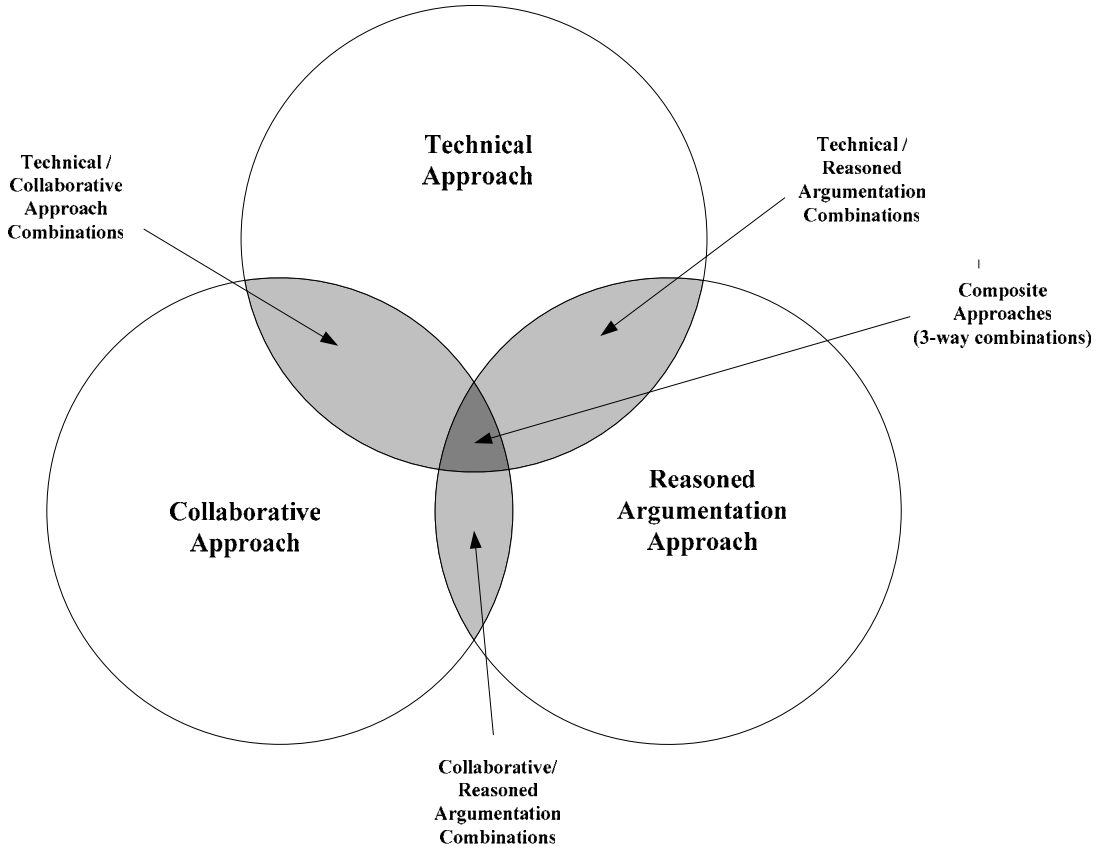
Three approaches to impact significance determination have been presented. Each exhibits both positive and negative tendencies. Each approach, depending on how it is designed and managed, can provide (or may not provide) a sound basis for impact significance determinations. The acceptability and suitability of the approach employed depends in part on context, and in part on the extent to which good practices are used and poor practices avoided. In general terms the technical approach tends to be especially effective in integrating technical and scientific analysis and knowledge. The collaborative approach tends to be more effective in integrating community knowledge and perspectives. The reasoned argumentation approach tends to be especially effective in deriving and documenting the rationale for significance judgements in a form that all parties can understand and potentially support.

The positive tendencies of any of the approaches can be reinforced. Negative tendencies, with appropriate adjustments and adaptations, can be largely avoided and minimized. Blended approaches offer the potential to offset the negative tendencies of individual approaches. It is neither necessary nor appropriate to suggest that any of the approaches (or any approach combination) is inherently superior or inferior. It is, however, reasonable to suggest (with appropriate substantiation) that a particular approach or approach combination is more or less suited to a particular context. Also, it is reasonable (again with appropriate substantiation) to indicate that a particular approach or approach combination exhibits good or poor practices in impact significance determination. In the most extreme cases (e.g., significance determinations without substantiation, demonstrable bias, serious factual inaccuracies in the basis for significance determinations, failure to consider major factors that should have a bearing on importance judgements, failure to consider the perspectives of parties with a direct interest in the outcomes from the EIA process, an approach clearly inconsistent with key contextual characteristics and / or with decision-making requirements) severely flawed impact significance determinations could contribute to a decision that EIA documents require major revisions or are unacceptable. Again, such conclusions should be fully substantiated, including links to regulatory requirements.

As illustrated in Figure 2, composite approaches could blend two or all three approaches. Examples of possible two-way composite approaches include:

- A technical approach;
    - Supplemented and informed by frequent or continuous public involvement and collaborative opportunities; and/or
    - That utilizes collaborative technical analysis methods (e.g., Delphi).
- A collaborative approach;
    - Structured by thresholds or criteria or other technical methods; and/ or
    - Supported by technical analysis; or
    - With provision for technical membership in collaborative forums; or
    - With periodic technical involvement; or
    - A combination of the above.
- A collaborative approach;

Figure 2
Composite Significance Determination Approaches



    - Which involves and integrates reasoned arguments by each party; and/or
    - Where parties work together to jointly and collaborative make and substantiate significance judgements.
- A reasoned argumentation approach;
    - Where the reasoning process is structured around public issues; and/or
    - Where the reasoning process is structured around stakeholder perspectives.
- A technical approach;
    - Where technical analysis is presented as a reasoned argument in EIA documents; and/or
    - Where technical analysis is condensed and summarized by technical staff and then converted and refined into reasoned arguments by hearing panels.
- A reasoned argumentation approach;
    - Which is;
        - Structured by thresholds and criteria; or
        - Structured by other technical methods; or
        - Supported by technical analyses, peer reviews and applied research; or
        - Supported by technical staff;
        - A combination of the above.

Examples of possible three-way composite approaches to impact significance determination include the following:

- A collaborative approach informed by technical analysis, and involving reasoned oral and written argumentation by the parties;
- A technical approach informed by a collaborative public and agency consultation program, and summarized in reasoned arguments in EIA reports and / or in panel decisions;
- A reasoned argumentation approach informed by both technical analysis and collaborative forms of public involvement;
- A fully integrated approach where technical and collaborative approaches;
    - Proceed in parallel with periodic cross checks and synthesis; or
    - Move iteratively between one another; and
    - Where reasoned argumentation integrates the results of each.
- A tiered approach (e.g., technical at the regulatory level, collaborative at the applied level, reasoned argumentation at agency review and panel stage);
- A framed approach:
    - A collaborative approach to establishing priorities and issues and technical methods within that framework; or
    - A technical approach that establishes generic thresholds and criteria (with public involvement) followed by collaborative adaptation and refinement; and
    - Technical specialists and major parties work together to jointly formulate reasoned arguments in favour of significance determinations.
- A partnership approach where politicians, the public, government officials and technical specialists work together on task forces or committees, aided by alternative dispute resolution, and informed by public participation forums and technical analyses to decide what is important and why; and

- A composite approach (as indicated above) but structured by substantive goals (e.g., sustainability) and /or by shared visions (e.g., community / regional plans, policies).

The choice of the most appropriate composite approach to impact significance determination varies with context. Composite approaches offer the potential to:

- Offset the negative tendencies of individual approaches;
- Link and combine technical analysis / knowledge with community knowledge / perspectives;
- Link and integrate the qualitative with the quantitative;
- Combine reason, analysis, and values;
- Combine multiple forms of expression (e.g., written, visual aids, oral);
- Generate solutions and insights where the whole is more than the sum of the parts; and
- Bridge the perspectives, interests and values of technical specialists, procedural specialists, government agencies, community groups, Aboriginal peoples, interest groups and other interested and affected parties.

Adopting a composite approach does not mean that this potential will be realized. A tiered approach, where alternative approaches are used at different levels, for example, may inhibit integration and exacerbate conflicts. A composite approach, where other approaches, constitute little more than minor add-ons is unlikely to offset negative tendencies, and can be viewed by other parties as "tokenism". Composite approaches, if poorly designed and applied, can be more complex and difficult to manage, and can be costly, difficult to understand, and more time-consuming. Sometimes it is impossible to reconcile or counterbalance fundamentally different value-based perspectives regarding what is important and why. Poorly constructed, different elements of a composite approach can undermine the effectiveness of others (i.e., the whole is less than the sum of the parts). On some occasions, it may be better to take a hard line on what is and is not important for substantive environmental reasons rather than adopt a composite significance determination approach, which leads to unnecessary environmental impacts or compromises in the quest for consensus.

The need for adaptations to context and the variety of composite approaches does not imply that "anything goes" in blending approaches. As indicated by the appendix tables there are ample opportunities for bad practice. A composite approach, which simply combines poor practices or which treats other approaches as minor add-ons is not an improvement. A concerted effort should be made to reinforce the positive tendencies, offset the negative tendencies, use good practices (subject to contextual adaptations), and avoid poor practices. In addition, again with suitable contextual adaptations, good general impact significance determination practices can be integrated into individual or composite impact significance determination procedures (see Table A-8). A proposed impact significance determination approach also can be assessed against procedural and substantive objectives (see Section 2.3), and reviewed against the major significance determination properties (see Section 2.4).

Effective impact significance determination relies upon numerous support methods. For example:

- A variety of technical qualitative and quantitative analysis, aggregation and evaluation techniques are available for applying and combining thresholds and criteria (See Section 3.1);
- A range of effective public consultation methods (see Table A-3) can support collaborative impact significance determination approaches;
- Many group interaction procedures (e.g., peer review, Delphi, task forces, workshops, alternative dispute resolution) can facilitate collaborative approaches to significance determination;
- Effective use can be made of community and regional plans and community surveys / interviews in establishing local and regional perspectives, values, and aspirations;
- A variety of methods (e.g., distributional analysis, environmental justice and gender analysis, ecological and human health assessments) can help identify potentially significant inequities in the distribution of impacts;
- Literature reviews, applied research, and case study analyses can assist in identifying the significant impacts and environmental components associated with comparable projects and environments;
- Various methods are available for characterizing values (e.g., value trees) and stakeholders (e.g., stakeholder analysis);
- A range of procedures are available for exploring the uncertainties associated with impact significance determinations (e.g., uncertainty analysis, scenario writing, sensitivity analyses, adaptive management, the Precautionary Principle, risk assessment, fuzzy set analysis); and
- Tools, such as scenarios, models, system maps, network diagrams, schematic trees, life cycle analysis and matrices, can enhance understanding of significant system interactions.

4. Distinctions and Connections

4.1 Variations for Individual and Cumulative Effects

Cumulative effects assessment (CEA) explores whether individually insignificant impacts become significant when combined, either at the project level, or in conjunction with other past, present or likely future activities affecting the same environment. The potential to induce cumulative effects can be a significance criterion when making judgements regarding the importance of individual impacts. Also, significance judgements occur as part of the CEA stage in the EIA process. Because of the nature of cumulative effects, significance thresholds and criteria tend to vary somewhat from those applied to individual impacts. CEA, for example, interprets the significance of such impacts as:

- Amplifying and linear additive effects;
- Compounding and synergistic effects;
- Discontinuous effects (e.g., cross boundary movements, time lags, spatial lags);
- Crowding effects (e.g., within a narrow time span, within a limited spatial area);

- Thresholds, triggers and structural surprises (e.g., exceeds ecological or community service capacity);
- Nibbling, habitat fragmentation, patchiness and incremental insults;
- Growth-inducing effects (e.g., spin-off activities);
- Precedent-setting actions or actions that represent a pre-condition to the implementation of another undertaking;
- Bio-magnification; and
- Feedback effects (Hegmann and Yarranton, 1995).

CEA tends to make greater use of holistic, interdisciplinary perspectives and methods (e.g., network diagrams and models) in seeking to better understand the importance of environmental and components and interactions, with and without individual and multiple interventions. The interpretation of impact significance, with and without mitigation, also changes with an increased emphasis on goal setting and on impact management through regional planning, regional environmental and resource management, strategic environmental assessment, multi-project monitoring, public-private partnerships, and regional sustainability strategies. Particular emphasis is placed on the significance of cumulative impacts relative to the carrying and assimilative capacity of ecological and socio-economic systems, resources and communities.

The combination of complex regional ecological, social and economic systems, the difficulties in managing pervasive environmental problems, the ill-defined roles for the host of stakeholders, and the extended temporal and spatial horizons, tend to mean that uncertainty and uncertainty management assume an enhanced role when interpreting the significance of cumulative effects. Collaboration among interested and affected parties in data collection and analysis, and in impact interpretation and management is essential if meaningful, joint significance determinations are to be made. CEA can be an effective bridge between significance determination at the project-level and significance determination as part of sustainability assessment.

A separate report, prepared for the Joint Review Panel, addresses in detail cumulative effects assessment issues and methods.

4.2 Variations for Bio-Physical and Socio-Economic Effects

Scientific and / or the adaptive management models tend to be favoured when interpreting the significance of physical and biological impacts. With the scientific model, a high premium is placed on objectivity, on technically and scientifically sound databases, on quantification, and on the effective integration of consistent standards, objectives and protocols (Costello et.al., 2001; Kirk, 2000;Lynch-Stewart and Associates, 2000 and 2002). Adherents to this approach tend to favour technical impact significance methods. Supporters of adaptive management generally temper the scientific approach by stressing the need to adaptively manage uncertainty, and to periodically use collaborative procedures such as workshops. Workshops or similar forums provide the opportunity for government officials, specialists, environmental managers and other stakeholders to

jointly decide what is important, integrate analyses and derive effective management strategies.

There are several differences between bio-physical and socio-economic impact assessment (SIA) with significance determination implications. For example:

- Social and economic impacts commence with project announcement and planning;
- People can and do alter their behaviour in anticipation of impacts;
- They adapt, to varying degrees, to change;
- The EIA /SIA process and the public role in the process can alter the nature, magnitude and importance of social and economic impacts;
- Sometimes perceptions, and resulting behavioural changes, are based on misconceptions;
- Interpretations of the significance of social and economic impacts vary greatly over time, and among groups, communities and sectors of society because of differences in values, beliefs, perceptions, interests and attitudes;
- Many types of social and economic impacts (e.g., empowerment concerns, gender issues, poverty concerns, community image, cultural and archaeological impacts) have no parallel among physical and biological impacts;
- Many social phenomena are complex, contentious, changeable, uncertain and subject to multiple interpretations;
- Social impacts tend to be difficult to manage;
- Meaning and value are socially determined and are adjusted through social interactions;
- Significance determinations are especially subjective for social and economic impacts because they are filtered through multiple values, beliefs and perspectives, and are highly dependent on context;
- Dialogue is central to social interactions. Distortions in dialogue can exacerbate adverse social impacts;
- Effective public participation can be critical in reducing some social and economic impacts to acceptable levels;
- The interpretation of social and economic impact significance is inhibited by SIA limitations (e.g., conflicts among technical, scientific, collaborative and political SIA approaches, highly variable practice, secondary status to bio-physical impact assessment, lack of a uniform set of criteria for evaluating SIAs); and
- The interpretation of social and economic significance is inhibited by social science constraints (e.g., multiple, overlapping and competing models, approaches that tend to be critical and discursive rather than predictive and explanatory, many concepts are not amenable to empirical measurement).

There is some potential for using legal and other pre-defined thresholds for interpreting such socio-economic impacts as health, noise, and heritage and resource displacement. Quantitative aggregation methods help interpret the significance of the economic, population, housing, service and municipal financial impacts associated with projects with large workforces and purchasing requirements. But for most other potentially significant social and economic impacts (e.g., displacement of people, composite impacts on people and communities, capacity to change, sustainability, vulnerability, inequity)

public reasoned judgements in combination with collaborative consultation (aided by generic criteria , qualitative and semi-quantitative assessment procedures and technical judgement), is the more common practice. Collaborative approaches to significance determination tend to be favoured by SIA practitioners. Collaborative EIA processes can facilitate dialogue, contribute to co-learning, minimize communications distortions, build consensus and ameliorate conflicts. Such procedures not only facilitate decision-making about what is socially and economically significant, they can be instrumental in ameliorating and avoiding potentially significant adverse social and economic impacts, and in enhancing positive impacts and community benefits.

Social and economic impact assessment tends to be overshadowed by physical and biological impact assessment at the regulatory level and in much of EIA practice. Consequently, social and economic impact assessment significance interpretations must generally fit into technical, quantitative, natural scientific frameworks and procedures. The unequal status of bio-physical and socio-economic impact assessment, and the common failure to appreciate the implications of the differences between bio-physical and socio-economic impact assessment, can mean that the significance of impacts that interconnect and transcend disciplinary boundaries receive limited attention. Composite significance determination approaches that make suitable adjustments to allow for the differences between biophysical and socio-economic impacts, and that systematically address the significance of interdisciplinary impacts, are necessary to ameliorate these potential problems.

4.3 Significance Determination and the Precautionary Principle

The Precautionary Principle (PP) addresses the dilemma of what to do when scientific knowledge is incomplete but there is a threat of serious adverse consequences. In such cases the lack of full certainty should not be used as a reason to preclude or postpone actions to prevent harm (IAIA, 2003; WHOROE, 2001). Lack of certainty, also should not be used as a reason for approving a planned intervention or for not requiring the implementation of mitigation measures and stringent monitoring (IAIA, 2003).

There are numerous interpretations of the PP and concerning if, when and how it should be applied. Interpretations vary regarding the definitions of terms (e.g., harm, threat, serious), when action should be triggered (e.g., harm alone, irreversible harm, catastrophic potential), the applicable evidence standards, and the actions that should be taken (e.g., reject the project, ameliorate impacts, prove the project is safe, proceed only if a reasonably convincing case can be made that the project is safe, proceed with caution).

The PP also is controversial. It can reduce harm and address uncertainties. It ensures that harm reduction options are fully explored, and project acceptability is seriously assessed. It places more of the “burden-of-proof” on proponents. It contributes to environmentally prudent, democratic and substantive (advances environmental and social values) decision-making (Government of Canada, 2001; Tickner et.al., 1998). But it is so open to interpretation that it has been used to justify everything from minimal change (i.e.,

slightly more cautious decision-making) to the rejection of any project (i.e., there is always some uncertainty). Potential decision-making considerations, other than uncertainty, can sometimes be ignored or oversimplified. The PP can be abused. It can serve to stifle innovation, advance dubious agendas (e.g., trade protectionism), raise unwarranted fears, misallocate resources and discredit scientific knowledge.

Some of the ways in which impact significance determination can change when the PP is applied include:

- Uncertainty becomes an explicit factor in significance determination;
- At a minimum significance judgments are more tentative and cautious;
- Harm potential, coupled with uncertainty, can provide a basis for project rejection during screening or at the end of the process (e.g., project benefits outweighed by the combination of adverse impacts, uncertainties and severe harm potential);
- Greater weight is given to uncertainty and harm avoidance in interpreting impact significance when selecting, screening and comparing alternatives, and when determining the need for mitigation and/or monitoring;
- Uncertainty can elevate an impact significance rating (e.g., from minor to moderate);
- The implications of uncertainties for decision-making (e.g., additional analysis, favouring alternatives that hedge away from large losses, additional monitoring and contingency measures, additional consultation) are explicitly considered;
- Sensitivity analyses test the implications of alternative interpretations of impact significance;
- Uncertainty may trigger the need for mitigation and/or monitoring;
- More stress is placed on assessing the vulnerability of potentially affected populations, on protecting the interests of future generations, and on hedging away from risks and harm (e.g., risk avoidance, least regrets, preventative anticipation);
- Proponents have a greater responsibility (i.e., reversed burden of proof) for demonstrating safety and harm avoidance;
- The shift in the “burden of proof” can mean that the balance of benefits over negatives has to be greater if there are considerable uncertainties regarding the magnitude of either the benefits or the adverse effects;
- The public tends to have a greater say in deciding what is significant. Their fears about irreversible harm, the validity of impact predictions and the effectiveness of mitigation measures cannot be so easily dismissed;
- Greater methodological attention must be devoted to analyzing, interpreting and managing uncertainties;
- Significance determination procedures can become more open, transparent and accepting of public concerns, perceptions and positions; and
- The significance determination process tends to be more iterative and adaptive.

Given its discretionary nature and its potential for misapplication, the integration of the PP into impact significance determinations should be approached with caution. An open and democratic decision-making process is essential. The significance of the risks and uncertainties of both action and inaction should be assessed. Terms should be defined. Methods, assumptions and decision rules should be explicit and substantiated. Good practice guidance can aid in realizing the benefits of applying the PP while still avoiding

potential drawbacks. Care should be taken to avoid the drawbacks and pitfalls associated with how the concept is sometimes applied. Regardless of the extent to which the PP is formally integrated into significance determination procedures, it is still necessary to identify and manage uncertainties, and to adaptively anticipate and respond to unforeseen circumstances. The relationship of the Precautionary Principle to sustainabilility also is addressed in a separate report prepared for the Joint Review Panel by Dr. Robert B. Gibson.

4.4 Significance Determination and Sustainability

The definition of sustainability most commonly used is that of the World Commission on Environmental Development (WCED): "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 8). There are debates surrounding the definitions of sustainability and sustainable development. The debates concern whether, for example, the definitions should be broadened and adapted to address intra-generational inequities, spatial inequities, human aspirations, other species needs, public participation in decision-making, ecological limits, relationships among sustainability forms, and sustainability instruments. Increasingly, as pointed out in the Panel paper prepared by Dr. Gibson, the general characteristics of sustainability assessment are now evident. Common to most definitions is a desire to maintain, over an indefinite future, necessary and desired attributes of the socio-political systems and of the natural environment (Deakin et.al., 2002).

Impact significance determinations can change dramatically when sustainability is a primary goal of EIA requirements, processes and documents. For example:

- Alternatives are screened for sustainability and compared for their relative contribution to sustainability;
- The focus shifts from minimizing damage (i.e., reducing the negative) to maximizing long-term gains and opportunities for multiple parties;
- Both positive and negative impact significance are addressed;
- Time horizons are extended to consider significance for future generations;
- More attention is devoted to interdependencies within and among social, economic, physical and ecological systems;
- More attention is devoted to cumulative impacts (e.g., lasting, net environmental and human benefits), and to systems-level, collective impact significance (e.g., net contribution of social, economic, physical, and ecological changes to sustainability);
- Proposed actions are viewed as potential sustainability catalysts or as impediments to sustainability;
- EIA processes and proposed actions are viewed as potential vehicles for advancing community aspirations, and for promoting community development and capacity;
- Proposed actions are assessed against both likely and desired (sustainable) futures;
- An impact from a proposed action is considered negatively significant if it inhibits sustainability;

- It is considered positively significant if it makes a durable contribution to achieving local and regional sustainability visions and strategies, and to furthering global and future generational interests;
- Sustainability can be a significance threshold;
- Sustainability can be a significance criterion (i.e., a factor for evaluating impact significance);
- Impact significance can be interpreted by applying specific quantifiable sustainability criteria (when impacts can be predicted with accuracy), and sustainability principles (when factual information is lacking);
- Land and resource use impact significance interpretations focus on the resilience of the human environment, on the sustainability of land uses, and on the optimization of resource use and management;
- Greater stress is placed in significance determinations on identifying and protecting the most vulnerable, the poor and the disadvantaged; and
- Significance interpretations, at the project level, operate within the context of and are explicitly linked to broader sustainability visions and aspirations.

Sustainability is not without its critics and potential drawbacks. The concept is to some, albeit a diminishing number of commentators, vague and sometimes confusing (e.g., sustainable environment or sustainable development). Consequently, it can be used to justify minimal action, fundamental change, and/or multiple, often conflicting, actions. The theoretical base for sustainability is quite well developed. But many questions are still being raised regarding how best to determine what is sustainable, over what area, and for how long a period. There are many debates concerning who is to decide what is and is not sustainable. Apportionment procedures, how to consider uncertainties, and the treatment of compromises and trade-offs are difficult issues requiring further attention (Gibson, 2002). The fragmentation of disciplines, sectors and institutions continues to hinder integration efforts. Sustainability indicator systems are sometimes borrowed uncritically from other settings and then misapplied. It is sometimes difficult to make broad sustainability concepts and principles operational in legal/administrative settings. Dilemmas abound (e.g., sustainable activities that supports an unsustainable development, unsustainable activities that are conducive to a sustainable environment). On the positive side, a broad consensus regarding the common characteristics of sustainability assessment has emerged, the range of sustainability initiatives is enormous, the record of tangible improvements from these initiatives is considerable, and sufficient experience has been acquired to identify general properties and effectiveness factors. Effective impact significance determination, within the context of sustainability assessment, involves building on progress to date and positive experiences, and acknowledging and confronting potential limitations and dilemmas.

A separate report, prepared by Dr. Robert B. Gibson for the Joint Review Panel, addresses in detail sustainability-based assessment criteria and associated frameworks for deliberation and decision.

5. Conclusions and Future Directions

Impact significance, as a concept, is quite simple (i.e., importance-related judgements). These judgements focus on decision-making interpretations, address the interplay of impacts and the receiving environment, vary by context and perspective, operate at the regulatory and applied levels, involve the application of procedures and methods, and can be defined broadly or narrowly.

Systematic, explicit, open and thoughtfully supported significance judgements are central and critical to effective EIA practice at the regulatory and applied levels. EIA significance determination practice has advanced to the point that it is possible to identify procedural significance determination objectives (e.g., focused, explicit, logical, substantiated, systematic, traceable, appropriate, consistent, inclusive, collaborative, effective, adaptable). No significance determination or method can fully achieve these objectives. Procedural objectives can help select, adapt and combine significance determination methods. Substantive impact significance determination objectives should be explicit and consistently applied. They should be established early in the EIA process (e.g., scoping). Interested and affected parties should help establish and substantiate procedural and substantive significance determination objectives. Arguably, the burden of proof should be on those seeking to apply very limited procedural and substantive objectives for impact significance determinations.

Impact significance determinations are subjective, normative and value-dependent. They are imprecise, vary among EIA activities and environments, and are context-dependent. They are political, are often controversial, are not the same as magnitude of change, involve a process, are collective, and are complex and difficult. Impact significance determinations vary among EIA process activities. Impact significance determination processes vary depending on the approach and methods selected. But they generally are staged, iterative, and usually provide for internal and external involvement and support. These properties should be considered when formulating, adapting and applying significance determination procedures and methods.

Impact significance determination is widely recognized as a vital and critical EIA activity, both in Canada and in other jurisdictions. Yet it remains one of the most complex and least understood of EIA activities. There is considerable variability in how impact significance is treated at the regulatory and applied levels. A great many significance determination procedures, criteria and methods are available from EIA literature and elsewhere. No consensus has emerged regarding the most appropriate and effective methods or combinations of methods. There is considerable room for improvement in impact significance determination practice. Impact significance determination has been criticized as being ill or too narrowly defined, as biased in favour and against particular values and practices, and as devoting too little attention to some types of impacts, to uncertainties, to theory, and to lessons from practice. Many but not all the ascribed limitations can be ameliorated with better practice. Some divisions in perspective and intractable problems will remain. Also, given the centrality of values,

subjectivity, complexity, conflict and uncertainty, unequivocal good practice impact significance determination standards are unlikely to emerge.

Three broad approaches to impact significance determination are described – 1) the technical approach; 2) the collaborative approach; and; 3) the reasoned argumentation approach. The technical approach breaks significance questions down to their constituent parts and applies a technical procedure to progressively aggregate the relevant impact significance determination considerations. With the collaborative approach interested and affected parties jointly, in interactive forums closely connected to broader constituencies, determine what is acceptable and unacceptable, important and unimportant, and how much importance to attach to each concern and potential impact. The reasoned argumentation approach views significance determination as a process of making reasoned judgements, supported by technical and non-technical evidence.

These three approaches have been formulated and refined to the point that general characteristics (at the regulatory and applied levels), specific methods, positive and negative tendencies, and good and poor practices can be identified. Positive tendencies can be reinforced. Negative tendencies can be minimized. Good practices can be refined, adapted to context and applied. Poor practices can be avoided and minimized. No single approach is generally preferable or is always preferable for particular classes of situations. There are sufficient negative tendencies linked to each approach that composite approaches are worth considering. Several two and three-way approach combinations are identified. A range of support methods and numerous general good impact significance determination practices also are identified.

Combinations of approaches have the potential to counterbalance many of the negative tendencies of individual approaches. Potentially they can link and combine technical analysis and knowledge, community knowledge and perspectives, the qualitative and the quantitative, reason, analysis and methods, and multiple forms of expression. They also can potentially generate synergistic insights, and bridge the interests, values, and perspectives of multiple interested and affected parties. These potential benefits will not necessarily be realized. Composite approaches also can either perpetuate or aggravate poor practices.

Cumulative effects assessment (CEA) interprets the significance of the overall impacts from the proposed project, in combination with the effects of other past, present and likely future activities that affect the same environment. Both individual and CEA apply methods and procedures to interpret the importance of potential impacts. But the scope and range of considerations, the significance determination process, the methods used, and the areas of emphasis are all altered and broadened when the significance of potential cumulative impacts are determined. A similar range of modifications in process, methods, scope and emphasis also occurs when interpreting the significance of bio-physical as compared with socio-economic effects, when applying the PP, and when integrating impact significance determination and sustainability. Appropriate allowance should be made for such differences. Due consideration should be given to the characteristics,

strengths, limitations and potential for misapplication associated with different forms of impact assessment, and when applying such concepts as the PP and sustainability.

Impact significance determination is very much a “work in progress”. The “learning curve” associated with impact significance determination can be greatly accelerated with additional conceptual and methodological refinements and testing, by more sharing of experiences, with further applied case studies, research and follow-up studies, by refining and adapting relevant EIA requirements and guidelines, by means of further good and poor practice guidance, and with a concerted effort to better match contextual characteristics and significance determination methods and processes. At the same time residual limitations, divisions and dilemmas should be acknowledged, together with practice implications.

References

Barrow, C.J. *Environmental and Social Impact Assessment – An Introduction*. London: Arnold, 1997.

Barrow, C.J. *Social Impact Assessment – An Introduction.* New York: Oxford University Press Inc., 2000.

Beanlands, G.E., and P.N. Duinker. *An Ecological Framework for Environmental Impact Assessment in Canada*. Hull, Quebec, and Halifax, Nova Scotia: Federal Environmental Assessment Review Office and Institute for Resource and Environmental Studies, 1983.

Beckwith, J.A. "Social Impact Assessment: Can It Deliver?" *Paper Presented to the Annual Meeting of the International Association for Impact Assessment*, Hong Kong, June 2000.

Boothroyd, P. *Social Policy Assessment Research: The Establishment, The Underground.* Vancouver, British Columbia: Centre for Human Settlements, School of Community and Regional Planning, University of British Columbia, February 1998.

Burdge, R.J. "Why is Social Impact Assessment the Orphan of the Assessment Process?" *Impact Assessment and Project Appraisal* 20,1 (March 2002): 3-9.

Burdge, R.J., and F. Vanclay. "Social Impact Assessment: A Contribution to the State of the Art Series." *Impact Assessment* 14,1 (March 1996): 59-86.

Canter, L.W. 1996. *Environmental Impact Assessment.* Second Edition. New York: McGraw-Hill, Inc., 1996.

Canter, L.W., and G.A. Canty. "Impact Significance Determination – Basic Considerations and a Sequenced Approach." *Environmental Impact Assessment* 13,5 (September 1993), 275-297.

Canadian Environmental Assessment Agency (CEAA). *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects – A Reference Guide for the Canadian Environmental Assessment Act*. Hull, Quebec: CEAA, 1993.

Couch, W.J. "The Role of Public Participation in Environmental Impact Assessment." *Aplinkos Inžinerija*. Vilnius, Lithuania: Vilniaus Gedimino Technikos Universitetas, VII Tomas, 1, 2000, 43-53.

Deakin, M., S. Curwell, and P. Lombari, "Sustainable Urban Development: The Framework and Directory of Assessment Methods." *Journal of Environmental Assessment Policy and Management* 11,3 (September 2002): 171-197.

Environment Canada. *Strategic Environmental Assessment at Environment Canada: An Integrated Approach to the Environmental Assessment of Policy, Plan and Program Proposals.* Gatineau, Quebec: Environment Canada, 2003.

Federal Environmental Assessment Review Office (FEARO). *Initial Assessment Guide.* Ottawa, Ontario, Canada: FEARO, 1985.

Gartner Lee Limited (GLL). *Evaluating Significance: An Initial Scan of Relevant Literature and Guidance Materials*. Markham, Gartner Lee Limited, 2001.

Gibson, R.B. *Specification of Sustainability-based Environmental Assessment Decision – Criteria and Implications for Determining Significance in Environmental Assessment*. Hull, Quebec: Canadian Environmental Assessment Agency, 2002.

Gilpin, A. *Environmental Impact Assessment (EIA): Cutting Edge for the Twenty-First Century.* Cambridge, UK: Cambridge University Press, 1995.

Government of Canada. *A Canadian Perspective on the Precautionary Approach/Principle: Discussion Paper*, Ottawa, Canada: Government of Canada, September 2001.

Hegmann, G.H. and G.A. Yarranton, *Cumulative Effects and the Energy Resources Conservation Board's Review Process,* Macleod Institute for Environmental Analysis, Working Paper No. 1, Calgary, Alberta, Canada, July 1995.

Hildén, M. "Evaluation of the Significance of Environmental Impacts." *Report of the EIA Process Strengthening Workshop, Canberra 4-7 April 1995.* Hull, Quebec: Canadian Environmental Assessment Agency and International Association for Impact Assessment, January 1997.

Holden, A. "Recommendations for Better Practice in Social Impact Assessment in Queensland." *Paper Presented at the International Association for Impact Assessment Conference, Hong Kong*, 1999.

International Association for Impact Assessment (IAIA). *Social Impact Assessment International Principles*. Special Publication Series No. 2. IAIA: Fargo, ND, USA, May 2003.

Kirk, D. *A Decision Support Tool to Aid in Evaluating Significance of Adverse Effects on Birds for Environmental Assessment,* Canadian Environmental Assessment Agency, 2000.

Kjellerup, U. "Significance Determination: A Rational Reconstruction of Decisions." *Environmental Impact Assessment Review* 17,1 (January 1999): 3-19.

Larcombe, P. Winds and Voices Environmental Services Inc., *Determining Significance of Environmental Effects: An Aboriginal Perspective.* Canadian Environmental Assessment Agency, 2000.

Lawrence, D.P. "Quantitative Versus Qualitative Evaluation: A False Dichotomy?" *Environmental Impact Assessment Review* 13,1 (January 1993): 3-12.

Lawrence, D.P. *Significance in Environmental Assessment, Background Paper # 3*, Canadian Environmental Assessment Agency, August 2002.

Lawrence, D.P. *Environmental Impact Assessment – Practical Solutions to Recurrent Problems.* New York: John Wiley and Sons, Inc., 2003.

Lawrence, D.P. *The Significance of Social and Economic Effects in Environmental Assessment*. Canadian Environmental Assessment Agency, March 2004.

Lynch-Stewart and Associates. *Using Ecological Standards, Guidelines and Objectives for Determining Significance*. Canadian Environmental Assessment Agency, 2000.

Lynch-Stewart and Associates. *Sharing Good Practice*. Canadian Environmental Assessment Agency, 2002.

Marusich, L.J., Paul F. Wilkinson and Associates Inc. *The Application of Fuzzy Logic Analysis to Assessing the Significance of Environmental Impacts: Case Studies from Mexico and Canada*, Canadian Environmental Assessment Agency.

McBride, G.B., J.C. Loftis and N.C. Adkins. "What Do Significance Tests Really Tell Us About the Environment?" *Environmental Management* 17,4 (July/August 1993): 423-432.

Morgan, R.K. *Environmental Impact Assessment*. Dordrecht, The Netherlands: Kluwer, 1998.

Pritchard, D. "Towards Sustainability in the Planning Process: The Role of EIA." *Ecos* 14,3-4, (August-December 1993): 10-15.

Rakowski, C.A. "Evaluating a Social Impact Assessment: Short and Long-Term Outcomes in a Developing Country." *Society and Natural Resources,* 8,6 (November-December 1995), 525-540.

Ross, W.A., and D. Thompson, in D. Thompson, ed. "Environmental Impact Assessment." *Tools for Environmental Management*. Gabriola Island, B.C: New Society Publishers, 2002.

Sadler, B. *Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance.* Final Report of the International Study of the Effectiveness of

Environmental Assessment. Ottawa, Canada: IAIA and Canadian Environmental Assessment Agency, Ministry of Supply and Services, 1996.

Sippe, Rob, in Judith Petts, ed. “Criteria and Standards for Assessing Significant Impact.” *Handbook of Environmental Impact Assessment*. Malden, MA: Blackwell Science, 1999.

Tickner, J., C. Raffensperger, and N. Myers. *The Precautionary Principle in Action: A Handbook.* Ames, Iowa: Science and Environmental Health Network, 1998.

United Nations Environment Program (UNEP). *Environmental Impact Assessment Training Resource Manual*, Second Edition, Australian EIA Network. URL: http://www.unep.ch/etu/publications/EIAMan_2edition_toc.htm, 2002.

Vanclay, F. “Social Impact Assessment.” In Petts, J., ed., *Handbook of Environmental Impact Assessment, Volume 1*. Oxford: Blackwell Science, 1999.

Westman, W.E. *Ecology, Impact Assessment and Environmental Planning*. New York: John Wiley and Sons, Inc., 1985.

Wood, G. and J. Becker, “Evaluating and Communicating Impact Significance in EIA: A Fuzzy Set Approach to Articulating Stakeholder Perspectives.,” *Presentation to the International Association of Impact Assessment Conference*, Vancouver, Canada, 26-29 April, 2004.

World Commission on Environment and Development (WCED), *Our Common Future*, Oxford: Oxford University Press, 1987.

World Health Organization Regional Office for Europe (WHOROE). *Precautionary Policies and Health Protection: Principles and Application.* Rome, Italy: Report of a WHO Workshop, 2001.

Appendix A – Tables

Table A-1 – Technical Approach – Examples of Positive and Negative Tendencies

Positive Tendencies	Negative Tendencies
• Treats comparable situations in a comparable manner (i.e., they are consistent) • Is explicit regarding the substantiation of interpretations and the basis for decision-making • Can generate debate and discussion regarding what is important and why, which can, in turn, provoke decision-makers to make their positions known, and stimulate the consideration of alternative actions (Rakowski, 1995) • Is traceable and, when clearly defined thresholds, criteria, and decision rules are employed, can be replicable • Makes value judgements and the role of participants explicit • Is amenable to the integration of public standards and policies, which can, in turn, facilitate the realization of public sector priorities • Is well suited to the systematic and comprehensive integration of scientific and technical analysis and knowledge • Makes many worthwhile distinctions (e.g., impact magnitude, receptor sensitivity, project phases, study area variations) • Is well suited to systematically addressing and adapting to uncertainties (e.g., alternative assumptions, evolving values, data limitations) • Is adaptable to variations in level of measurement • Is suitable for focusing on key decision-making factors • Effectively bridges the regulatory and applied levels (e.g., broad thresholds, criteria and procedures defined at regulatory level, thresholds, criteria and methods refined and adapted to context at applied level)	• Excludes or marginalizes the public or politicians (e.g., public concerns are at best a criterion or at worst are excluded entirely); the more quantitative the procedure the more intimidating it tends to be for the general public • Inhibits the integration of community knowledge and insights, especially in terms of the most vulnerable and least organized segments of society • "Force-fits" thresholds, criteria and aggregation procedures, if mechanistically formulated and applied, in a manner that is inappropriate to the context • Subtlety reinforces existing power relations (e.g., can diminish the decision-making influence of local communities and groups and individuals most directly impacted and most vulnerable to change) • Creates or exacerbates conflict when insufficient effort is made to build community trust or when thresholds or criteria are, or are perceived by the community to be, arbitrary or biased • Is prone to subtle and implicit biases (e.g., most easily measured over the most important, technical over community knowledge, facts over values, certain over uncertain) • Artificially extends the role of the technical specialist from expert in data and data analysis to expert in value interpretation and judgement • Artificially disaggregates and then aggregates the environment and effects in a manner that inhibits an understanding of the importance of system-level characteristics, and of indirect and cumulative impacts • Fails to provide a forum for mutual learning and interaction (e.g., the type of synergy that can occur in a group setting where the focus is specific issues and concerns rather than artificial categories and procedures) • Produces outputs from techniques (e.g., scores) without the reasoning process necessary for public and political understanding, involvement and support • Inhibits innovation and adaptation when procedures are highly structured by very detailed requirements and complex procedures.

Table A-2 – Technical Approach – Good and Poor Practices

Good Practices	Poor Practices
• Ensure that the analysis addresses both significance thresholds and degrees of significance. • Ensure that thresholds and criteria are clearly defined, unambiguous, readily applicable, and fully substantiated. • Ensure that thresholds and criteria are relevant to and linked to the local and regional context. • Be sensitive to potential impact discontinuities (e.g., exceeds ecological or community service carrying capacities). • Ensure that the procedures for applying thresholds and criteria are explicit, logical, clearly explained, easily applied, fully substantiated, and appropriate for the available data and values. • Ensure that the degree of precision is consistent with the reliability and level of measurement of the relevant data. • Explicitly integrate public and agency concerns and preferences. • Treat thresholds as a point of departure for agency and community discussions rather than as absolute standards to be applied regardless of public involvement. • Ensure that the significance determination criteria and procedures are directly relevant to and explicitly linked to decisions in the EIA process. • Allow for the possibility that different impact types may require different significance determination approaches and methods. • Identify and take into account the characteristics, strengths and limitations of specific methods. • Explicitly take into account uncertainties and associated implications. Seek to minimize the consequences of being wrong. • Address the significance of positive and negative, direct and indirect, individual and cumulative, and bio-physical and socio-economic effects. • Provide regulatory requirements and guidelines for applying technical significance determination procedures that take into account the positive and negative tendencies of such methods. • Take into account the implications of impact management measures, bearing in mind potential differences in the effectiveness of such measures. • Ensure that the choice and application of thresholds, criteria and methods are conducive to determining if and the extent to which substantive environmental and sustainability objectives are being advanced. • Ensure that the significance determination thresholds, criteria and methods are conducive to interpreting major proposal-related issues, identified valued socio-economic and ecological components, and the major anticipated impacts.	• Failing to define or ambiguously defining thresholds, criteria and scaling levels • The use of criteria and procedures, which are difficult to understand or apply • Failing to consider the potential for major discontinuities (e.g., carrying capacity); Also concerns the use of arbitrary thresholds that bear no relationship to major discontinuities in the degree or nature of potential impacts • Interpretations of importance based on unsubstantiated professional or technical judgements • Unduly narrow definitions of impact significance (e.g., only if adverse, only indirect social and economic impacts, only if contrary to government requirements or policies, only if can be quantified) • Failing to consider the significance of indirect and cumulative impacts, and the implications of impact management effectiveness differences • Thresholds, criteria and procedures that bear little relationship to EIA decision-making needs • The use of thresholds and criteria, which are so broad or "blunt" that the importance of critical impact dimensions and distinctions is likely to be overlooked • Significance determination procedures that result in inconsistent application in comparable situations • The presentation of impact significance judgements as no more than an output (e.g., a rating) from a technical procedure, with no effort to explain the reasoning behind the output • A failure to consider degrees of significance (i.e., only either significant or insignificant) • A level of precision in the analysis for all or some potential impacts that cannot be supported by the data or by available information concerning values • Implicit or explicit biases (e.g., toward what is measurable over what is important), and unsubstantiated assumptions • Failing to take account for and adapt criteria and procedures to contextual characteristics (e.g., the uncritical borrowing of criteria and methods from other settings) • Thresholds, criteria and procedures, which are clearly inappropriate to the local and regional context • Thresholds, criteria and procedures which provide minimal understanding of if and the extent to which the environment and affected populations and communities are better or worse off • Failing to adequately consider uncertainties and associated implications • The assumption that impact magnitude is equivalent to impact significance • Procedures that do not allow for, inhibit or take minimal account of public or political concerns, preferences and knowledge (i.e., EIA significance judgements centralized at the technical level) • Failing to consider the possibility of or take into account fundamental value conflicts or the possibility of changing values and perspectives

Table A-3 – Collaborative Approach – Specific Methods		
Significance Determination Forms	**Procedural Assistance Methods**	**Methods – Links to Broader Public**
• Panel or forum of technical specialists (e.g., Delphi) • Public advisory committee (provides recommendations concerning potentially significant effects and issues, as well as recommended remedial measures) • Joint evaluation committee or task force (where a combination of public, political, proponent and government representatives are full partners in significance determination) • Independent panel or individual, funded by the proponent, to provide an external and unbiased perspective on potentially significant issues and impacts • Public task force or panel (has delegated power to identify key issues and impacts) • Structured group procedure (e.g., Interactive Community Forums) (small groups separately and then jointly identify potentially significant issues, impacts and management measures) • Stakeholder bargaining (major parties negotiate, with or without alternative dispute resolution, significant issues, impacts and management measures) • Community focus group (provides multiple perspectives on significant areas of concern) • Commission, inquiry or hearing panel (to integrate and evaluate multiple impact significance perspectives)	• The use of third parties, such as conciliators, facilitators and mediators to support the process • Participant funding to facilitate the involvement of those parties lacking the resources to fully participate in the process • The use of EIA specialists to provide technical support (e.g., provision of technical and scientific data and analysis regarding such matters as impact magnitude, receptor sensitivity, and the distribution of potential impacts) • Funded research of significance determination literature, and of experiences with comparable proposals in comparable settings) • Procedural training of participants • The application of creative problem-solving methods (e.g., simulation, brainstorming, lateral thinking methods, scenario writing, community visioning and shared vision planning)	• Open houses and community forums • Plebiscites or referenda • Public meetings, workshops, retreats, conferences and roundtables • Storytelling and traditional knowledge • Surveys, interviews and questionnaires (e.g., citizen value analysis) • Key informant interviews, participant observation, and focus groups • Web sites, hot lines, mail-in responses, and local television • Community or social profiling (to better understand issues, interests and perspectives) • Direct action (e.g., petitions, lobbying, demonstrations) • Community development and capacity building (facilitates ability of community members to participate in and influence decision making) • Community liaison officers, field offices, community contact persons • Training of community members to conduct surveys and interviews

Table A-4 – Collaborative Approach – Positive and Negative Tendencies

Positive Tendencies	Negative Tendencies
• Open and inclusive • Facilitates public understanding and involvement • Builds community credibility, trust, and support • Places the public and elected representatives central to rather than at the periphery of significance determination judgements • Ensures the direct and ongoing involvement of all interested and affected parties • Facilitates mutual learning • Focuses on key value-based choices and tradeoffs • Minimizes artificial boundaries and distinctions • Conducive to synergistic and creative interpretations and problem-solving • Facilitates understanding and dialogue between decision-makers and interested and affected parties • Ensures that procedural and equity concerns associated with significance determinations are fully addressed • Facilitates the involvement of the most vulnerable and most affected individuals, groups and communities • Emphasizes the most sensitive and vulnerable environmental components and segments of society • Ensures that procedures and judgements are appropriate to the context • Fosters local and regional empowerment and democratic decision-making • Provides and maintains effective communications between the individuals / groups directly involved in the process and broader constituencies • Minimizes the potential for arbitrary choices, and biases • Reflects local and community perspectives, goals and aspirations • Minimizes the potential for top-down and outside-in values and perspectives dominating significance determinations • Conducive to mutual learning and substantive environmental improvements • Readily adapts to changing attitudes, values and perspectives, and to changing local / regional conditions and proposal characteristics • Consistent with the subjective, qualitative and uncertain nature of significance determination • Conducive to the integration of community and traditional knowledge	• Oversimplifying complex issues and interactions (i.e., not comprehensive) • Treating parallel situations in different ways (i.e., prone to inconsistencies) • Can be difficult to trace (i.e., group decisions clear but reasoning process that provided the basis for the decisions not always as clear) • Placing heavy demands on individuals participating in ongoing interactive forums (i.e., prone to high turnover and resulting need for bringing new participants "up to speed") • Involving individuals in ongoing interactive forums who are not "representative" of broader constituencies • Making some decisions and interpretations based on incomplete or incorrect information and knowledge • Making decisions based on consensus when difficult but controversial significance determinations are more environmentally sound • Prone to domination by a few vociferous and aggressive individuals • Having difficulty coping with major value and worldview conflicts • Prone to the influence of fear mongering and scare tactics • Attaching limited value to non-local and regional concerns and priorities (e.g., national and international needs and perspectives) • Producing results that do not stand up well to intense scrutiny, especially in judicial and quasi-judicial forums • Making judgements without adequate understanding and consideration of available technical and scientific analysis and knowledge

Table A-5 – Collaborative Approach – Good and Poor Practices

Good Practices	Poor Practices
• Make a concerted effort to involve, prior to each judgement and decision, the most directly affected and vulnerable individuals, groups and communities. • Ensure early, effective and frequent links back to the broader public. • Adapt consultation methods to the characteristics and needs of each public. • View from multiple perspectives, consistent with the range of values and interests held by interested and affected parties. • Employ multiple forms of participation, tailored to the needs and characteristics of the interested and affected parties. • Ensure that the process is open, transparent and inclusive. • Fully consider and integrate technical, community and traditional knowledge. • Ensure that the membership in interactive forums (small and large group) reflects the full range of interests and values associated with the proposed action. • Ensure complete documentation of the rationale for all interpretations and conclusions, with direct ties to decision-making. • Immediately seek to correct and resolve misinformation and misunderstanding. • Focus on major local and regional issues and tradeoffs from multiple perspectives. • Ensure that support materials and advice are unbiased, and are conducive to understanding and application by participants. • Provide measures to offset procedural inequities (e.g., participant funding) where needed to ensure the full participation of interested and affected parties. • Ensure that the substantive implications of the compromises needed to achieve consensus are considered before significance determinations are made. • Consider lessons and insights from comparable situations. • Be aware of and seek to facilitate the achievement of community goals, visions and aspirations. • Ensure, where pertinent, the full consideration of Aboriginal society values, interests, perspectives, rights, priorities, worldviews, concerns and knowledge in significance determinations. • Avoid discrepancies between the values represented by the significance determinations, and the values of local and regional communities. • Draw upon, as needed, alternative dispute resolution (e.g., facilitators, conciliators and mediators). • Make effective use of fully qualified consultation specialists, with ample relevant local and regional experience. • Provide, where needed and requested, procedural and substantive training for forums participants, and for community members to conduct their own significance-related research and interviews. • Actively seek to facilitate community empowerment and local democratic decision-making, without ignoring or undervaluing broader values and perspectives. • Take into account the concerns, policies, and priorities of relevant government agencies and of the proponent. • Seek to balance interests and perspectives, while devoting particular attention to the most vulnerable and most affected environmental components and segments of society.	• The selection of committee members who are not and make no effort to represent the interests and perspectives of broader constituencies (e.g., individuals pursuing their own agendas) • Failing to minimize the potential for a few individuals dominating interactive proceedings • No, minimal, or very infrequent links back to the broader public • A failure to document or adequately document the rationale for significance determinations • Inconsistencies in the treatment of comparable situations • Inconsistencies between available data and significance determinations (e.g., based on misinformation or misunderstandings) • Failing to devote sufficient attention to scientific and technical insights and knowledge, to predicted risks and uncertainties, and to related decisions • Failing to adequately consider the potential significance of risks and impacts that have not been identified as major issues • The sacrifice of substance, equity and unrepresented interests in the quest for consensus • The oversimplification of complex issues and interactions • Failing to cope when there are major divisions within or among communities • Failing to integrate all relevant perspectives, values and interests • Failing to make effective use of community and Aboriginal knowledge • Failing to act promptly and effectively to counter rumours, fear-mongering and misinformation • Failing to devote full consideration to Aboriginal society values, interests, perspectives, rights, priorities, concerns and worldviews • Failing to proactively involve the most directly affected and the most vulnerable individuals and groups in society • Over-reliance on a small number of consultation procedures • Failing to adapt consultation procedures to the characteristics and needs of local and regional populations and communities • Failing to take into account or to seek to advance community goals and aspirations • Failing to draw upon, when needed, available procedural assistance (e.g., alternative dispute resolution, training) • The use of procedures that inhibit community empowerment and local democratic decision-making • Failing to give sufficient attention to the concerns, priorities and policies of relevant government agencies and the proponent • Failing to consider the lessons and insights from comparable situations • Insufficient effort not to overburden a small number of individuals • Failing to consider non-local concerns and priorities

Table A-6 – Reasoned Argumentation Approach – Positive and Negative Tendencies

Positive Tendencies	Negative Tendencies
• Well suited to substantiating judgements as expressed through interpretations, conclusions and recommendations • Highly conducive to internal and external scrutiny; traceable • Expressed in a form that can be readily understood by all parties; highly accessible and understandable • Consistent with the form that all parties tend to be make their points • Consistent with the format of government guidelines and review comments • Can be readily understood and applied by review agencies and hearing panels; long history in quasi-legal and legal forums • Sufficiently flexible that can encompass both individual and cumulative impacts • Not wedded to pre-defined environmental and impact categories; tends to reflect a systems perspective • Fully adaptable to contextual variations • Conducive to progressively focusing on matters directly relevant to decision-making • Conducive to systematically exploring issues and choices from multiple perspectives • Makes explicit the underlying logic behind significance determinations • Consistent with the subjective nature of significance determinations • Well suited to readily integrating public concerns and preferences • Well suited to integrating community and traditional knowledge • Can be directly linked to public policies • Recognizes that will ultimately be necessary to provide reasoned substantiation for significance judgements • Sufficiently flexible that can draw upon decision aids (e.g., maps, drawings, tables, technical analyses) to substantiate significance judgements • Consistent with the critical and discursive discourse that occurs in both the natural and social sciences • Consistent with how judgements are made and supported in democratic decision-making; political representatives likely to be more comfortable with this approach • Adaptable to both oral and written arguments and presentations • Conducive to the blending of the technical and the non-technical	• Inconsistent; simply using reasons and advantages and disadvantages leaves open the possibility that comparable situations will not be treated in a comparable manner • Prone to advocacy (i.e., case making rather than the systematic exploration of available choices from multiple perspectives) • Prone to bias (e.g., selective use of information and analysis, implicit values) • Unclear when incomplete • Prone to information loss; in the effort to reduce to fundamentals, key pieces of information and analysis may not be applied or applied effectively • A reasoned argument constructed by one or a small number of individuals may fail to encompass the fully range of values and perspectives • May not fully and systematically integrate all relevant technical and scientific knowledge and analyses • A lengthy written exploration of matters relevant to significant determination could be inefficient and difficult to follow; tendency not to make adequate use of decision aids, such as matrices and tables, that can consistently consolidate a great deal of information and analysis in a succinct and readily understandable format • Emphasis on qualitative reasoning can mean that insufficient use is made of quantitative analyses when data are available that can support such analyses • Can be technically weak; tendency not to consistently or systematically apply significance thresholds and criteria • Considerable variation from project to project; not necessarily the result of local variations; “hit or miss” learning curve • Unclear how to reconcile conflicting perspectives and arguments; although can encompass multiple perspectives does not derive the full benefits (e.g., mutual learning, synergy) of dialogue and negotiation, especially if such collaborative forums are aided by alternative dispute resolution • If significance determinations are made through the reasoning processes of independent third parties can inhibit local and regional decision-making and empowerment • May not be suitable for systematically exploring the implications of uncertainties for significance determinations

Table A-7 – Reasoned Argumentation Approach – Examples of Good and Poor Practices

Good Practices	Poor Practices
• Identify and explicitly seek to achieve procedural objectives for significance determination. • Identify and explicitly substantiate, early in the EIA process, substantive objectives for significance determination. • Make systematic use of both technical and scientific knowledge. • Make systematic use of community and traditional knowledge. • Systematically explore the arguments and perspectives of all interested and affected parties. • Guard against advocacy and bias. • Ensure that judgements are supported by qualitative and quantitative data, clear evidence, logical deduction, and reasoned arguments. • Ensure that substantiation for significance judgements are traceable and explicit. • Ensure that the reasoning process for significance judgements is sensitive to contextual characteristics. • Make use of decision aids whenever practical and appropriate. • Provide opportunities for collaborative reasoning processes, including the possible use of alternative dispute resolution. • Make a concerted effort to treat comparable situations in a comparable manner. • Make a concerted effort to draw upon all relevant data, analyses and knowledge. • Explicitly consider the implications of information loss as progressively summarize and distil to major relevant reasons. • Build in insights from comparable environments and projects. • Make a concerted effort to support rather than inhibit local and regional democratic decision-making. • Explicitly consider the implications of uncertainties in making significance judgements. • Incorporate a range of distinctions (e.g., choices, perspectives, study areas) when structuring significance determinations.	• Reasons without taking into account multiple and varying perspectives, values, beliefs and interests • Reasons with only limited consideration of available technical and scientific knowledge • Reasons with only limited consideration of community and traditional knowledge • Reasons without taking into account public policies, and knowledge, and perspectives and positions of government review agencies • Failing to explicitly identify and apply procedural and substantive objectives for impact significance judgements • Making a case (i.e., advocacy or bias) through reliance on data and arguments that only or largely support predefined positions • Deciding that important or unimportant based solely on technical or scientific opinions, without substantiating opinions • Not considering the potential implications of context for reasoning process behind significance judgements • Failing to make effective use of decision aids • Failing to provide opportunities for collaborative reasoning • Addressing each judgement separately without considering the need to consistently treat comparable situations • Rapidly reaching judgements without considering all potentially relevant data, analyses and knowledge • Failing to consider the implications of information loss as progressively summarize • Not making an effort to learn from comparable situations • Ignoring the local and regional political implications of significance judgements (e.g., inhibits local decision-making and empowerment) • Ignoring the implications of uncertainties in making significance judgements • Failing to consider the implications of how the factors bearing on significance determination are structured

Table A-8 – Examples of General Good Practices – Impact Significance Determination

Focused and Efficient

- Focus efforts and resources on matters critical and relevant to decision-making.
- Consider insights and lessons from comparable projects and environments in focusing significance determinations.
- Focus on major community and regional issues and concerns.
- Focus on major values and value tradeoffs.
- Focus on those environmental components most susceptible to change and on likelihood and ability to enhance capacity to adapt to and manage change.
- Build on knowledge base established through EIA quality and effectiveness analyses (e.g., good practice principles).

Explicit and Clear

- Ensure that value basis for all judgements can be readily understood.
- Ensure that the roles of all parties in the significance determination process are clear.
- Clearly describe all procedures. The explanation of the approach should be straightforward and non-technical.
- Distinguish among impact magnitude, impact likelihood, environmental significance, and impact significance.
- Address significance with and without mitigation.
- Address significance of positive and negative impacts.
- Address significance of individual and cumulative effects.
- Explicitly integrate public and agency concerns and preferences.
- Distinguish, where appropriate, significance of impacts associated with various project phases, for various study areas, and for various time horizons.
- Distinguish between ecological and socio-economic importance.
- Use illustrative materials where can facilitate understanding.
- Text should be concise and thoughtfully reasoned.
- Employ simple to use and widely supported criteria.
- Be explicit regarding level of confidence in significance judgements.

Logical and Substantiated

- Ensure that full use is made of technical and scientific knowledge.
- Ensure that full use is made of community and traditional knowledge.
- Substantiate all methods and assumptions.
- Clearly define and substantiate role of each party in significance determination.
- Interpretations and conclusions should flow logically from support materials.
- Fully substantiate all thresholds, criteria, scaling levels and indicators.
- Guard against advocacy and bias.
- Ensure that judgements are supported by qualitative and quantitative data, clear evidence, logical deduction, and reasoned arguments.
- Make use of decision aids wherever practical and appropriate.

Systematic and Traceable

- Ensure a coherent, transparent and orderly procedure for integrating impact characteristics, environmental characteristics, contextual factors, institutional requirements and objectives, and the perspectives and concerns of interested and affected parties.
- Ensure that the attribution of significance is made in a rational, defensible and problem-relevant way.
- Ensure that other parties can independently reconstruct how judgements were derived from the relevant inputs.
- Address significance for each EIA activity, with appropriate adjustments to reflect characteristics of each activity.
- Systematically analyze and interpret impact significance for each valued socio-economic and ecological component, especially for the most vulnerable environmental components and segments of society.
- Ensure that significance determination approach culminates in a judgement about project acceptability.

Appropriate

- Place within the context of local and regional issues and challenges.
- Place within the context of corporate social, environmental and sustainability policies.
- Link judgements to local perceptions and to local and regional ecological, social, economic and political problems and challenges.
- Place within the context of community and regional conditions.
- Place within the context of historical, current and emerging conditions.
- Ensure that significance determination methods and procedures are appropriate to the culture, and to the social, ecological, economic, legal and political setting.
- Take into account regulatory framework including previous and relevant judicial and panel decisions.

Consistent

- EIA guidelines (generic and project-specific) should explicitly and consistently address impact significance.
- Ensure that comparable situations are treated in a comparable manner.
- Ensure that alternatives are treated consistently.
- Apply thresholds, criteria and significance determination procedures consistently.

Open and Inclusive

- Define significance broadly. Burden of proof should be on those seeking to define more narrowly.
- Ensure the involvement of technical specialists.

Table A-8 – Examples of General Good Practices – Impact Significance Determination
• Ensure the direct, early and ongoing involvement of interested and affected parties. • Ensure that consultation methods appropriate to the characteristics and needs of each interested and affected party. • Provide measures to offset procedural inequities. • Take into account the interests, values, and concerns of each interested and affected party. • Consider public and agency concerns and preferences. • Ensure that approach facilitates the involvement of all interested and affected parties. • Make a particular effort to involve those most directly affected, most vulnerable to change, and least likely to be able to participate in the process.
Collective and Collaborative
• Address impact significance from multiple perspectives. • Collaboratively design and adapt significance determination approach. • Ensure that significance determination approach is conducive to collaboration with interested and affected parties. • Ensure early, effective and frequent links to the broader public. • Thresholds, criteria and methods should be broadly supported. • Intensity and extent of public controversy can be a useful significance criterion. • Focus on what people consider is significant, in either a positive or a negative sense. • Ensure that the membership in interactive forums reflects the full range of interests and values associated with the proposed action. • Make effective use of alternative dispute resolution, where appropriate. • Provide procedural training to participants, as appropriate. • Make a concerted effort to support rather than inhibit local and regional democratic decision-making.
Effective
• Ensure consistent with EIA and environmental regulatory requirements. • Link to international standards, conventions and guidelines. • Link to national and territorial policies and standards. • Assess in terms of contribution to local and regional land use, environmental management and sustainability plans, policies, strategies and visions. • Ensure that approach is conducive to the realization of substantive objectives. • Make effective use of fully qualified specialists, with adequate local and regional experience and knowledge. • Assess in terms of compliance with land claims agreements and treaty rights. • Integrate lessons and insights from good practice significance determination procedures.
Adaptable
• Ensure that process for determining significance can adapt to varying roles in the process. • Ensure that the significance determination process is conducive to identifying and managing uncertainties. • Identify significant knowledge gaps and relevance to significance determination. • Use, as appropriate, uncertainty as a significance criterion. • Explicitly consider the implications of information loss as focus and summarize. • Immediately seek to correct and resolve misinformation and misunderstandings. • Recognize action limits and uncertainties, especially regarding mitigation effectiveness. • Ensure that the significance determination process can be adapted to changing circumstances. • Adapt approach to characteristics and needs of each interested and affected party. • Where uncertain seek to minimize the consequences of being wrong regarding both impact prediction accuracy and mitigation effectiveness.