

**Sustainability-based assessment criteria  
and associated frameworks for  
evaluations and decisions:**

**theory, practice and implications for the  
Mackenzie Gas Project Review**

**A report prepared for the Joint Review Panel for the Mackenzie Gas Project**

**by**

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This report was prepared by Robert B. Gibson for the Mackenzie Gas Project Joint Review Panel. The views, conclusions and recommendations expressed herein are solely those of the author, and do not represent the views of the Joint Review Panel.

## **Sustainability-based assessment criteria and associated frameworks for evaluations and decisions: theory, practice and implications for the Mackenzie Gas Project Review**

### ***Report summary***

In its July 2005 “Determination on sufficiency,” the Joint Review Panel for the Mackenzie Gas Project recognized sustainability as “a fundamental purpose of environmental impact assessment” and expressed its intention “to approach sustainability as an important framework to evaluate the evidence and argument on the issues and questions that are before it.” In this, the Panel is respecting the sustainability goals or commitments of the parties that initiated the review and following the path of other recent joint hearing panels in Canada, and many other sustainability-based assessment initiatives around the world.

To assist the Panel, its staff and the parties to the Mackenzie Gas Project review in preparing for and carrying out a review that applies a sustainability framework, this report discusses the nature and use of sustainability-based assessment criteria, and related means of applying a sustainability framework in the review of the Mackenzie Gas Project and its Environmental Impact Statement (EIS).

The report describes the basic principles of sustainability assessment and the main approaches available for use in cases such as the Mackenzie Gas Project. It discusses how the generic requirements for sustainability can be combined with consideration of the major issues of the Mackenzie Gas Project case (insofar as these are evident from a general understanding of the nature of the proposed project, the history of deliberations on pipeline proposals and implications in the Mackenzie Valley area, and the broader context of hydrocarbon initiatives and northern development) to form a reasonably comprehensive framework for addressing contribution to sustainability in this Panel review. It also considers the major implications for trade-off evaluations and related judgements involved in reaching conclusions and making recommendations in this case.

Although sustainability assessment has been undertaken in many ways in different circumstances, the common characteristics of serious attempts to do sustainability assessment can be summarized as follows:

- positive contribution to sustainability as the basic criterion for evaluations and decisions;
- scope that is comprehensive of all requirements for progress towards sustainability, and their interrelations (and therefore includes all factors that may affect prospects for meeting these requirements);

- focus on net gains as well as avoidance of significant (especially, permanent) losses;
- selection of case-specific purposes informed by “contribution to sustainability” objective;
- focus on identifying the best option, achieved in part by comparative consideration of possibly reasonable alternatives;
- attention to the full set of global and regional as well as local sustainability concerns, achieved chiefly through application of generic criteria;
- sensitivity to the particular context (ecological, cultural, socio-economic, etc.), achieved in part through direct engagement of stakeholders in identifying key case-specific concerns and priorities, and using these to supplement and/or elaborate the generic criteria;
- efforts to achieve multiple, mutually reinforcing gains in all the interrelated areas of sustainability concern, in addition to serving core project purposes;
- explicit attention to, and open rationales for, trade-offs among the recognized objectives;
- contribution to sustainability through the assessment process itself as well as through the better decisions that result, achieved in part through incorporating open participative approaches, respecting different interests, and integrating different kinds of knowledge; and
- treatment of assessment as an approach to decision making (in the conceptualization, planning, design, evaluation, approval, implementation and monitoring and eventual decommissioning of undertakings), not just a review at a particular stage.

Sustainability too has been defined in many ways, in part because the specifics and priorities always depend on the particular context of application. Nevertheless after some decades of deliberation and experimentation, there is broad agreement on the essential overall requirements for progress towards sustainability. These are set out in the report under the following headings:

- socio-ecological system integrity;
- livelihood sufficiency and opportunity;
- intragenerational equity;
- intergenerational equity;
- resource maintenance and efficiency;
- socio-ecological civility and democratic governance;
- precaution and adaptation; and
- immediate and long term integration.

In the design and management of undertakings that contribute to sustainability, the objective is to make progress towards all of these interrelated requirements, indeed to achieve mutually reinforcing gains and to avoid significant backwards steps. In practice, however, trade-offs are often unavoidable. Basic rules for dealing with trade-offs focus on maintaining maximum net gains, avoiding significant adverse effects especially in areas of existing concern, denying trade-offs that displace significant adverse effects from the present to the future and ensuring that all trade-off proposals are accompanied by explicit justifications and are examined in open processes.

In the body of the report, the generic sustainability criteria and major case/context specific issues are combined in two lists of issue areas and associated key questions. The first covers sustainability issues in the project area (which includes the immediate surroundings in the Northwest Territories and northern Alberta). The second list of issues covers the broader regional, national and global context which will affect and be affected by the project.

In appendix 3, these two lists are consolidated to present in a single framework the major evident sustainability-related issues (combining the generic sustainability criteria and major case/context specific considerations) for this project assessment. The issues are presented as questions under eleven headings:

- biophysical, ecological and socio-ecological systems and traditional activities;
- livelihoods and socio-economic well-being;
- equity;
- resource access, use and efficiency;
- boom and bust;
- bridging;
- capacity building;
- preparedness in the face of uncertainties;
- interactions among effects
- trade-offs; and
- alternatives

The questions in these groupings are set in a simple evaluation matrix in which judgements can be made about whether the particular and overall expectations are for

- fully beneficial results (there are firm grounds for expecting improved outcomes, and no significant damages or risks in any aspect are anticipated);
- net benefits but with some negative effects and risks that should be mitigable through tested methods;
- no assurance of net benefits (significant damages or risks are likely or possible, and adequate enhancement of positive effects and/or mitigation of adverse effects may depend on more information or firmly imposed conditions); or
- likely net losses, including significant negative effects or risks that are not adequately mitigable using tested methods.

While every question is important, for sustainability assessment purposes it is also crucial to treat the issues and answers as interrelated since the contribution-to-sustainability objective is to maximize mutually reinforcing positive effects while avoiding negative effects.

Because it is unlikely that all negative effects and risks can be avoided, preparation for dealing with trade-off issues is also needed. For the Mackenzie Gas Project case, proper consideration of trade-offs would entail

- recognition of the requirements for progress towards sustainability;
- identification of major recognized areas of concern relevant to potential project effects;
- identification of priorities for protection and improvement (chosen in light of the generic; sustainability criteria and the current and anticipated conditions in the areas where project effects might be felt);
- identification of all proposed and implicit trade-offs, and the rationales provided for them;
- rejection of all trade-offs that would displace a significant adverse effect from the present to the future (unless the alternative is displacement of an even more significant negative effect from the present to the future);
- open deliberations on what other trade-offs might be acceptable, in light of other options; and
- final judgements and recommendations reflecting the public deliberations and accompanied by explicit rationales for each potentially significant trade-off.

The sustainability issues lists and trade-off considerations outlined above integrate generic requirements and rules that apply in any sustainability assessment with recognition of the particular context of the project under review. Together, these sustainability issues lists and trade-off considerations constitute a basic working framework for sustainability assessment in the Mackenzie Gas Project case.

The Panel and other participants in the review will need to go well beyond what is provided here in determining what matters deserve most careful examination, where the greatest current challenges lie, what are the priorities among the sustainability requirements in this case, and what more specific criteria should guide judgements about unavoidable trade-offs. The framework does, however, cover the main sustainability and trade-off issues as identified in international study and experimentation with sustainability requirements and approaches to sustainability assessment. And it at least illustrates how the generic lessons can be integrated with case and context specific concerns to guide this assessment review. The results should help the Panel determine

- how the purpose of the project should be understood from the perspective of the local, regional and national interest in progress towards sustainability;
- whether and to what extent the project is needed;
- which effects are likely to be (or might be) most significant, given sustainability objectives;
- where important opportunities or perils have been missed and how current proposals and preparations need to be improved to ensure appropriate enhancements and mitigations;
- what trade-offs may be acceptable (or least unacceptable);
- whether the project as proposed is the best option, in light of other alternatives including alternative means of carrying out the project;
- whether and under what terms and conditions it should be approved; and
- what preparations by various parties are necessary and desirable to ensure that negative effects are avoided or mitigated, that unanticipated effects are identified and addressed quickly, and that maximum mutually reinforcing gains are achieved.

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## **Sustainability-based assessment criteria and associated frameworks for evaluations and decisions: theory, practice and implications for the Mackenzie Gas Project Review**

### ***The background situation and the need for a case-specific sustainability assessment framework***

The Joint Review Panel has been established to conduct an independent public Environmental Impact Review of the proposed the Mackenzie Gas Project. The Panel operates under an agreement signed by the federal Minister of the Environment and the Chairs of the Mackenzie Valley Environmental Impact Review Board and the Inuvialuit Game Council (MVEIRB et al, 2004). The Panel's work, and the assessment generally, is guided by the agreement and by "Environmental Impact Assessment Terms of Reference for the Mackenzie Gas Project" issued by the three authorities in August 2004 (IGC et al, 2004).

An Environmental Impact Statement (EIS) for the Mackenzie Gas Project was 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 in November 2004 (Imperial Oil et al, 2004).

The proposed project, as set out in the EIS submission, 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 by pipeline to market. If approved as proposed, the project will involve the following major components:

- drilling and completing wells, and installing operating facilities at Niglintgak, Taglu and Parsons Lake, including well pads, flow lines and gas conditioning facilities;
- installing infrastructure to support construction and operations activities, including barge landing sites, camps, fuel storage sites, stockpile sites, access roads, airstrips and helipads, and borrow sites;
- constructing and operating gas processing and separation facilities at Niglintgak, Taglu, Parsons Lake and in the Inuvik area;
- constructing and operating gathering system pipelines in the Mackenzie Delta for delivery of product from the three anchor fields to the Inuvik Area Facility, and from the Inuvik Area Facility;
- from the Inuvik Area Facility, constructing and operating a natural gas liquids pipeline and a natural gas pipeline, with the natural gas liquids pipeline connecting with the existing Enbridge Pipelines (NW) Inc. (Enbridge) pipeline at Norman Wells, and with the natural gas pipeline connecting with the Nova Gas Transmission Limited pipeline system at an interconnection facility to be built in Alberta near the Northwest Territories boundary;

- expanding and extending the natural gas pipeline from the existing Thunder Creek Compressor Station in Alberta to the NGTL interconnection facility;
- constructing and operating associated pipeline facilities including compressor stations, heater stations, metering and pigging facilities; and
- decommissioning and abandoning project components at the end of their operating life.

If the project goes ahead it will require and induce or facilitate additional undertakings, some more easily predictable than others. The effects of all of these together with existing and independently initiated activities will affect conditions, risks and opportunities in the project area and beyond and will be in some measure relevant to this assessment.

The agreement establishing the Panel requires a review that “will have regard to the protection of the existing and future social, cultural and economic well-being of residents and communities” including attention to the purpose of, need for, alternatives to, and alternative means of carrying out the project.

The Terms of the Reference (TOR) for the EIS require due consideration and application of the principle of sustainability (section 5.1), especially as it relates to local, regional and national economies (s. 15.2), the assessment of cumulative impacts (s. 17.0), the capacity of renewable resources to meet the needs of the present and the future (s. 18.0), and monitoring and follow-up programs (s. 25.0) (IGC et al, 2004). Elaborating on the “contribution to sustainability” principle, the Terms of the Reference document notes that at its core the challenges centres on “reconciling economic development, social equity and environmental quality” and that includes recognizing

- the potential impacts of the Project in relation to the social, economic, cultural and environmental goals and values of affected communities, the North and the rest of Canada
- the capacity of natural systems to maintain their structure and functions and to support indigenous biological diversity and productivity
- the capacity of the social and economic systems of the human environment to achieve, maintain or enhance conditions of self-reliance and diversity
- the capacity of human environments, including local and regional institutions, to respond to and manage externally induced change
- the attainment and distribution of lasting and equitable social and economic benefits from projects
- the rights of future generations to the sustainable use of renewable resources
- protection and conservation of wildlife and the environment for present and future generations (IGC et al, 2004, p.4).

In its “Determination on sufficiency” issued on 18 July 2005, the Panel reported that, subject to receipt of certain additional submissions, there was sufficient information to justify proceeding to the public hearings phase of its review. In that document, the Panel also clarified its intent to use a “sustainability framework” for the review. The Panel stated:

The environmental impact review of the proposed Mackenzie Gas Project is to have regard to the protection of the existing and future social, cultural and economic well-being of residents and communities, and consideration for the capacity of renewable resources that are likely to be affected by the Project. Sustainability is a fundamental purpose of environmental impact assessment and the Panel intends to approach sustainability as an important framework to evaluate the evidence and argument on the issues and questions that are before it.

In preparing for public hearings, the Proponent, Interveners and other participants should be aware that the Panel will evaluate the specific and overall sustainability effects of the proposed project and whether the proposed project will bring lasting net gains and whether the trade-offs made to ensure these gains are acceptable in the circumstances. Areas of recognized and potential concern that are relevant to making determinations about the specific and overall sustainability effects of the proposed project include the following:

- the capacity of natural systems to maintain their structure and functions and to support indigenous biological diversity and productivity;
- the capacity of the social and economic systems of the human environment to achieve, maintain or enhance conditions of self-reliance and diversity;
- the capacity of human environments, including local and regional institutions, to respond to and manage externally induced change;
- the attainment and distribution of lasting and equitable social and economic benefits;
- the rights of future generations to the sustainable use of renewable resources; and
- protection and conservation of wildlife and the environment for present and future generations.

Throughout the remainder of the review, it is the Panel's intention to direct questions specifically to these matters (JRP, 2005, p.5).

A central concern of the review consequently involves evaluation of the proposed project's broad "contribution to sustainability" as well as its more specific sustainability-related effects. The sustainability-based evaluation is comprehensive, covering social, cultural and economic as well as biophysical aspects of well-being, and long as well as short term effects. In addition, the review within the sustainability framework is to focus on prospects for lasting net gains and the acceptability of associated trade-offs.

Sustainability-based assessment in various forms has been introduced in many jurisdictions around the world. Although best practice approaches have not yet been established, the essential characteristics of effective sustainability assessment are evident and it is not difficult to identify generic sustainability requirements, criteria, trade-off decision principles, and associated process implications for most applications. The key difficulty is that sustainability needs and options always depend heavily on the particular circumstances involved. While generic sustainability requirements, criteria and principles provide a valuable foundation, they must be specified and elaborated in ways that recognize and respect the particular context (conditions, issues, expectations, priorities, etc.) of the case.

For the purposes of the Joint Review Panel's hearings, both the Panel and the proponent and other hearings participants are likely to benefit from case specific as well as generic guidance on how a sustainability framework might be applied and how contribution to sustainability may be considered in deliberations in this case.

### ***Objectives of this report***

The report aims to assist the Joint Review Panel, its staff and the parties to the Mackenzie Gas Project review in preparing for and carrying out a sustainability-based evaluation. More specifically it aims to clarify the nature and use of sustainability-based assessment criteria, and

related means of applying a sustainability framework in the review of the Mackenzie Gas Project and its EIS.

Accordingly, the report describes the main approaches available for use in such cases, and discusses how the generic requirements for sustainability can be combined with consideration of the broadly evident major issues of the Mackenzie Gas Project case to form a reasonably comprehensive framework for addressing contribution to sustainability in this Panel review. As well it includes consideration of the major implications for significance determinations and for trade-off evaluations and decisions.

### ***Outline of the report***

This report describes the development, use, most advanced thinking and practice, and current status of sustainability criteria in environmental assessment, with particular emphasis on describing the elements of a framework, and associated key questions, that could be applied in the context of the Mackenzie Gas Project assessment review.

The nine sections that follow discuss:

- sustainability-based assessment (why it arose, how it has been applied so far, and its particular relevance to this case);
- the design and application of sustainability-based evaluation and decision criteria (main approaches and issues for assessment uses);
- generic sustainability criteria (the core generic requirements for “contribution to sustainability” and their application as evaluation and decision criteria in assessments and related processes);
- guidance for handling trade-offs;
- elaboration of generic criteria for specific contexts (general approaches to integration of generic criteria with recognition of the concerns particular to a case and its context);
- integration of generic criteria with major considerations for the Mackenzie Gas Project case (selection of an approach suitable for the present case);
- the broadly evident major sustainability assessment issues for the Mackenzie Gas Project assessment (sustainability issues in the project area and immediate surroundings, related sustainability issues involving regional, national and global factors, consolidation of these issues lists, and considerations related to sources of answers, responses to uncertainty and recognition of interconnections);
- dealing with trade-offs in the Mackenzie Gas Project case; and
- the resulting nature of and role for a sustainability assessment framework for the Mackenzie Gas Project case.

### ***Sustainability-based assessment: origins, applications and best practice***

Sustainability-based assessment has been introduced in a variety of forms in many jurisdictions, mostly over the past decade. Both top-down and bottom-up motivations have been involved. Most obviously, sustainability-based assessment reflects the international attention to

sustainability prompted by the 1987 report of the World Commission on Environment and Development, chaired by Norwegian Prime Minister Gro Harlem Brundtland. The Brundtland Commission's call for sustainable development as an integrated response to the linked global problems of poverty and environmental degradation, was broadly plausible and widely attractive. But sustainability as a concept centred on the interdependence of social, ecological and economic concerns, and long as well as short term implications, was also welcomed as a useful basis for specific applications in deliberations on particular programs and projects or in individual agencies, firms and communities.

After 1987, many government bodies and other institutions, public and private, and at all levels from the global to the local chose to adopt sustainability language and to introduce new initiatives under a sustainability agenda of some sort. All of the major government parties to the Mackenzie Gas Project assessment have made formal commitments to the pursuit of sustainability (or sustainable development<sup>1</sup> or the equivalent).

The Canadian federal government expressed immediate support for the Brundtland Commission's call for efforts to enhance sustainability. In 1988 it established a National Round Table on Environment and Economy (Doering, 1993) and in 1995 it introduced legislated requirements for federal departments and agencies to produce Sustainable Development Strategies, which would have to be updated every three years and monitored by a special commissioner who operates in the Office of The Auditor General (OAG, 2004).

The Government of the Northwest Territories has been formally committed to sustainability at least since 1993 when it issued a special policy on sustainable development. The policy, renewed in 2005, says in part that

interdependence between conservation and development will be officially recognized by the Government of the Northwest Territories through the application of the concept of sustainable development to all its decisions and actions related to natural and heritage resources in the Northwest Territories (GNWT, 2005).<sup>2</sup>

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<sup>1</sup> For the purposes of this paper, "sustainability" and "sustainable development" are closely overlapping. Sustainable development may be considered the means of pursuing sustainability.

<sup>2</sup> The policy also outlines five core objectives:

The Government of the Northwest Territories recognizes that sustainable development of resources is essential to the long term economic security, self-sufficiency and social well-being of northern residents. The Government of the Northwest Territories shall, therefore, adopt the principles of sustainable development to guide all its decisions and actions related to resource use in the Northwest Territories.

Five main objectives shall provide the focus for pursuing this goal. These objectives shall be implemented through the Government of the Northwest Territories' own programs and through collaboration with other governments and organizations.

(a) Promote Integrated Resource Management

Recognizing that resource development decisions usually involve numerous management objectives and interest groups, the Government of the Northwest Territories shall promote an integrated approach to managing the environment and its resources.

(b) Maintain and Enhance Environmental Quality

Recognizing that the Northwest Territories' economy and cultures are deeply rooted in the environment, the Government of the Northwest Territories shall ensure that environmental quality is maintained to support the long term stability of northern society.

(c) Establish Conservation Areas

For Aboriginal governments and communities within the project area, sustainability objectives have been deeply imbedded in the underlying culture since long before the current terminology became popular. They have also been evidently central to the institutions and arrangements established in the land claim agreements applicable to this case. All the agreements apparently share the essential underlying objectives and understanding of sustainability initiatives. For example, in the Inuvialuit Final Agreement, which was reached before sustainability became a common term, the three core principles and substantive contents of the Agreement clearly recognize the need for integrated attention to long as well as short term socio-cultural, ecological and economic interdependencies (INAC, 1984).<sup>3</sup> Essentially similar objectives are at the foundations of the *Gwich'in Comprehensive Land Claim Agreement* (INAC, 1992) and the *Sahtu Dene and Metis Comprehensive Land Claim Agreement* (INAC, 1993).<sup>4</sup> The *Deh Cho First*

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Whereas the Government of the Northwest Territories will promote the consistent application of sustainable development principles to all lands and waters within the Northwest Territories, it recognizes the need for conservation areas to protect special values related to wildlife habitat, unique or representative ecosystems, prime forests, productive agricultural soils, and heritage, recreational, tourism, scientific and aesthetic resources.

(d) Develop Non-Renewable Resources in Ways that Contribute to a Sustainable Economy

The Government of the Northwest Territories will promote exploration, development and use of mineral, aggregate and fossil fuel resources in ways that provide lasting social and economic benefits while maintaining ecological processes and natural diversity.

(e) Promote Cooperation in the Management of Transboundary Resources

The Government of the Northwest Territories recognizes that bilateral or multilateral cooperation with other circumpolar and neighbouring jurisdictions will greatly help to prevent or abate transboundary environmental or socio-economic impacts (GNWT, 2005, pp.7-8).

<sup>3</sup> The principles are set out as follows (IFA, s.1):

The basic goals expressed by the Inuvialuit and recognized by Canada in concluding this Agreement are:

- (a) to preserve Inuvialuit cultural identity and values within a changing northern society;
- (b) to enable Inuvialuit to be equal and meaningful participants in the northern and national economy and society; and
- (c) to protect and preserve the arctic wildlife, environment and biological productivity.

<sup>4</sup> The statements of objectives in the two agreements are nearly identical. The version in the Sahtu Dene and Metis Agreement (INAC, 1992, p.2) is as follows:

The Sahtu Dene and Metis and Canada have negotiated this agreement in order to meet these objectives:

- (a) to provide for certainty and clarity of rights to ownership and use of land and resources;
  - (b) to provide the specific rights and benefits in this agreement in exchange for the relinquishment by the Sahtu Dene and Metis of certain rights claimed in any part of Canada by treaty or otherwise;
  - (c) to recognize and encourage the way of life of the Sahtu Dene and Metis which is based on the cultural and economic relationship between them and the land;
  - (d) to encourage the self-sufficiency of the Sahtu Dene and Metis and to enhance their ability to participate fully in all aspects of the economy;
  - (e) to provide the Sahtu Dene and Metis with specific benefits, including financial compensation, land and other economic benefits;
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*Nations Interim Measures Agreement* (INAC, 2001, p.4) refers explicitly to sustainability with respect to land use planning:

Taking into consideration the principles of respect for the land, as understood and explained by the Deh Cho Elders, and sustainable development, the Plan shall provide for the conservation, development and utilization of the land, waters and other resources in the Deh Cho territory.”

Among governments generally, especially in the early years of global and local thinking about sustainability, understandings of the concept varied and implementation lagged well behind expressions of commitment. Gradually, however, authorities began to incorporate their commitments in policy and law. This in turn encouraged steps to clarify the implications.

Moves to adopt and apply sustainability-based approaches to evaluation and decision making were strengthened by a variety of concurrent factors including

- expanded awareness of the interconnections among social, ecological and economic factors, especially in areas of pressing public concern and controversy (e.g., health, security, livelihood maintenance and opportunities, and future quality of life),
- advances in understanding complex systems (multiple interacting factors and dynamic self-organizing processes in multiple interacting systems, at various scales, with pervasive and inevitable uncertainties, etc.)
- continuing economic globalization combined with concerns about its implications for distributive justice, cultural identity, and ecological stewardship,
- recognition that many development failures and other tragedies have been traceable to neglect of factors outside the primary focus of the proponents and/or approving authorities,
- pressures on public authorities and private enterprises to enhance efficiencies, including by getting multiple benefits from individual initiatives,
- growing recognition of the limitations of both governments and markets and consequent shifts to more broadly-based and open governance regimes, and
- spreading acceptance of the precautionary principle in response to deepening concerns about global scale health and ecological risks, and declining faith in the potential adequacy of scientific knowledge and technical repair.

In this broad context, though with somewhat different particular emphases from one place to another, sustainability came to be used as an integrative concept that combined attention to the multiplicity of intertwined factors in complex socio-ecological systems, accepted uncertainty, favoured participative openness and extended concern from the immediate to the long term.

Practical applications of the sustainability concept have ranged widely from green building standards, forest stewardship certification and ethical investment analysis to national strategies, blueprints for sectoral reform (e.g., MMSD, 2002) and global progress indicator sets. Two important categories of applications have been those in urban, regional and resource planning

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- (f) to provide the Sahtu Dene and Metis with wildlife harvesting rights and the right to participate in decision making concerning wildlife harvesting and management;
  - (g) to provide the Sahtu Dene and Metis the right to participate in decision making concerning the use, management and conservation of land, water and resources;
  - (h) to protect and conserve the wildlife and environment of the settlement area for present and future generations; and
  - (i) to ensure the Sahtu Dene and Metis the opportunity to negotiate self-government agreements.
-

(e.g., the sustainability appraisal regime used in land use planning in the United Kingdom, and many of the legislated as well as ad hoc approaches used in North America for urban growth management) and those in development assistance undertakings (e.g., the Ghanaian review of national and regional poverty reduction plans, and the IUCN's application of a process linking conservation and development in project design). Many of these innovations in planning and development have overlapped with broadly-defined environmental assessment processes, especially as applied at the strategic level of policies, plans and programs.

Initiatives in sustainability assessment (sometimes called integrated assessment, sustainability appraisal, triple-bottom-line evaluation, etc.) have for some time now also been spreading rapidly in the field of impact assessment at the project and strategic levels. Some of the examples are Canadian. These include the ground breaking The text of the *Canadian Environmental Assessment Act* begins with a preamble statement recognizing the government's commitment to achieving sustainable development and set this as one of the purposes of the statutory purposes of the law (in section 4(1)(b)). The first panel review in Canada that applied explicitly sustainability-centred evaluation criteria was the assessment of the Voisey's Bay nickel mine and mill project on the north Labrador coast (VBEAP, 1999; Gibson, 2000). The most recent, aside from the Mackenzie Gas Project case, is the current assessment of the White's Point quarry and marine terminal in Nova Scotia (WPJRP, 2005).<sup>5</sup>

Sustainability assessment processes have also been applied in Hong Kong, Belgium, Namibia, Western Australia, South Africa, the European Union, and a host of other places (e.g., DeVuyst, 1999; Hodge, 2004; Grace and Pope, 2005; Dalal-Clayton and Sadler, 2005; Hacking, 2005). While many of these applications have relied on approaches developed specifically for the case at hand, a variety of broadly applicable sustainability assessment models and frameworks have been proposed and, at least to some extent, tested (e.g., Hodge, 2004; Devuyst et al, 2003; Partidario and Sheate, 2005).

Despite the wide variation in approaches taken and the limited experience so far, the common characteristics of serious attempts to do sustainability assessment are now evident enough. They are as follows:

- positive contribution to sustainability as the basic criterion for evaluations and decisions
- scope that is comprehensive of all requirements for progress towards sustainability, and their interrelations (and therefore includes all factors that may affect prospects for meeting these requirements),
- focus on net gains as well as avoidance of significant (especially, permanent) losses,
- selection of case-specific purposes informed by "contribution to sustainability" objective,
- focus on identifying the best option, achieved in part by comparative consideration of possibly reasonable alternatives,
- attention to the full set of global and regional as well as local sustainability concerns, achieved chiefly through application of generic criteria,
- sensitivity to the particular context (ecological, cultural, socio-economic, etc.), achieved in part through direct engagement of stakeholders in identifying key case-specific concerns and priorities, and using these to supplement and/or elaborate the generic criteria,
- efforts to achieve multiple, mutually reinforcing gains in all the interrelated areas of sustainability concern, in addition to serving core project purposes,
- explicit attention to, and open rationales for, trade-offs among the recognized objectives,

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<sup>5</sup> In both the Voisey's Bay and White's Point cases, the application of sustainability criteria was done by a joint review panel applying the *Canadian Environmental Assessment Act* in concert with provincial assessment law.

- contribution to sustainability through the assessment process itself as well as through the better decisions that result, achieved in part through incorporating open participative approaches, respecting different interests, and integrating different kinds of knowledge, and
- treatment of assessment as an approach to decision making (in the conceptualization, planning, design, evaluation, approval, implementation and monitoring and eventual decommissioning of undertakings), not just a review at a particular stage.

All of these characteristics are appropriate in the Mackenzie Gas Project case. They fit well with the history of assessment and planning in the Mackenzie Valley, which over the past three decades and more has been typified by recognition of the interdependency of social, ecological and economic matters, concern for overall long term viability and improvement, and continuing largely open public deliberations about common problems, objectives and potential responses. Arguably all of the characteristics are evident, at least to some extent, in the Terms of Reference, and other documents setting out the context and framework for the assessment and review.

### ***Design and application of sustainability-based criteria: main approaches and issues for assessment uses***

The core characteristics of sustainability-based assessment establish net gains as the basic objective. Ideally, these are delivered as multiple, mutually reinforcing benefits (e.g., replacement of old, inefficient technologies with new ones that use less materials and energy, provide more secure employment and lighten environmental burdens; or renewable resource harvesting initiatives that reduce dependence on outside sources, encourage transfer of knowledge from one generation to the next and build lasting connections to the land) and avoid all potentially significant adverse effects. Practically, however, most undertakings are initiated for relatively narrow purposes and bring the risk, if not the certainty, of adverse effects. To ensure attention to the full range of possible benefits, the review and approval process must identify all of the areas in which gains are needed and adverse effects must be avoided, and it must provide a basis for making judgements about what concerns are most important and what effects are most significant.

In any sustainability-based assessment exercise, specification of the core criteria for evaluations and decisions plays a major role. While “contribution to sustainability” is an agreeable purpose, it is by itself too vague to provide the needed guidance. A useful framework for sustainability-based assessment must set out

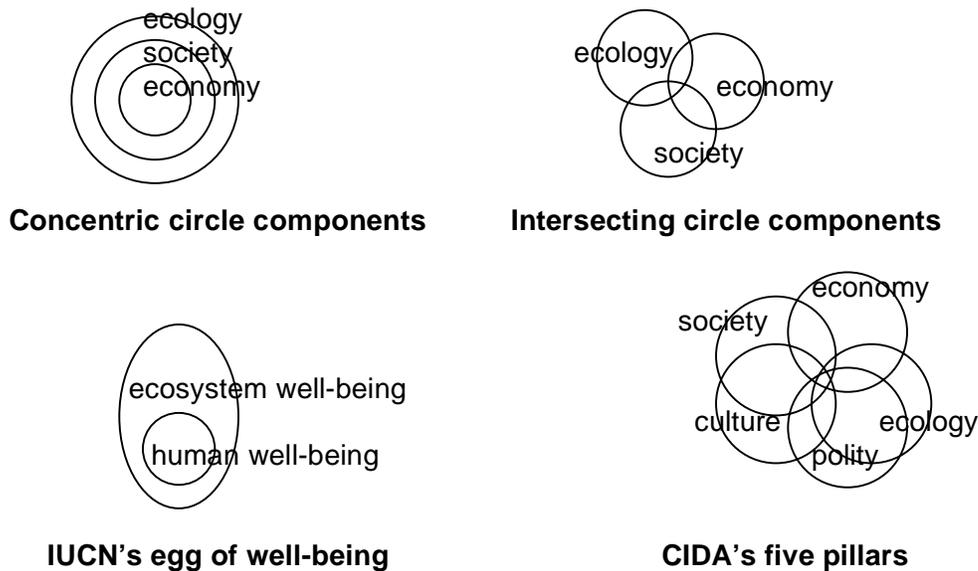
- the general categories of sustainability requirements that must be addressed,
- the particular factors that deserve attention in the given context and case, and
- the basic rules for dealing with trade-offs where there is conflict between objectives and attaining one desired result seems likely to entail compromising or sacrificing another.

In sustainability-based deliberations generally, the main factors affecting sustainability have often been divided into three pillars – ecological, social and economic – with efforts to define more specific needs in each category. The three pillar areas are recognized to be interconnected, but the nature of the links is debated.

The most common depictions take two basic forms (see Figure 1 below). The first is represented by concentric circles, with the economy immersed in society, which is in turn immersed in the biophysical environment. This is intended to emphasize the dependency of the economy on the

larger social whole and the dependency of both on a viable ecology. The second depiction uses interlocking circles, which suggest that each pillar is equivalent and all are interdependent so that contributions to sustainability are most assured where the three circles intersect. Both forms have variations. The International Union for the Conservation of Nature and Natural Resources (IUCN, now often called the World Conservation Union), for example, uses two concentric circles in its egg of biophysical and human well-being (Guijt et al, 2001). And the Canadian International Development Agency has used five intersecting circles, rather than the more usual three (CIDA, 1977).

**Figure 1: Common basic depictions of the components influencing prospects for sustainability**



The differences matter. The concentric circles suggests a hierarchy of priority with ecological considerations being fundamental. In comparison, the intersecting circles favour more or less equal attention to the identified pillar areas. All, however, have been developed and advocated as correctives in contexts where economic priorities have generally ruled. The primary overall message in each case is that explicit and serious attention needs to be given to a more comprehensive set of concerns, because they are interrelated and because all of them will influence prospects for multiple reinforcing benefits and durable gains.

Actual application of such conceptions in practical evaluation and assessment work has had to face some additional complexities. Four have been particularly important:

1. *Integration of the circle/pillar considerations:* While the circles of pillars identify big categories of concern that deserve attention and indicate their interdependencies, they provide little guidance for considering the various components together.

The IUCN's egg of well-being approach, for example, has been applied usefully as a methodology for sustainability evaluation that encourages careful attention not just to ecosystems and their life-support functions but also to achieving broadly social conditions that ensure "all members of society can determine and meet their needs, from a range of choices" (Guijt et al, 2001). But it is designed so that human and ecosystem well-being factors can be measured

separately. While this allows for comparison of progress in the two areas, it leaves the approach less well suited to achieving a well integrated understanding.

Similar problems are evident in the assessment approaches taken by CIDA and many other development assistance agencies. All of these agencies recognize that multiple factors contribute to the sustainability effects of development programs and projects. But they rely on more or less separate social, economic, ecological and other evaluations (including multiple assessment processes, “triple-bottom line” analyses, etc.). While the individual effects studies and reviews may be capably done, seeing and addressing the interrelationships and the overall picture continues to be a struggle.

Treating sustainability assessment as a combination of considerations in the usual economic, social and ecological categories fits very well with the long established divisions of expertise, authority and information. Professional training, government agency mandates and data sets are organized this way. Unfortunately, this specialization also raises barriers to communication, cooperation and mutual understanding. For sustainability assessment purposes, clearly, it is not enough to do separate economic, social and ecological studies and staple them together. Many of the crucial questions involve understanding how the various aspects interact and how to build a more durable and desirable overall package.

*2. Integration of case- and context specific considerations:* There are broad categories of sustainability-related considerations (and sustainability requirements, as will be discussed below) that apply virtually everywhere. But different places have different problems and possibilities. They have different ecologies and histories, resources, capabilities and traditions, hopes and fears. All of these are important in the planning and implementation of undertakings meant to contribute to sustainability.

All serious sustainability assessment processes recognize the importance of case- and context-specific factors and most of them include some process or processes for identifying and including the main concerns. Methods include studies of baseline conditions, incorporation of existing plan and policy priorities; broad public and other stakeholder consultations; technical studies of energy, materials and other flows; and local or regional development of desired future scenarios.

See for example, the approaches described in Appendix 1, especially the United Kingdom’s sustainability appraisal process for regional planning, the IUCN methodology, the sustainability urban planning approaches developed by Devuyst and Ravetz, and the Forest Stewardship Council’s certification criteria development process.

While some approaches attempt to fit case- and context-specific factors into a common pillar-based framework, the fit is not often entirely comfortable. Especially when the residents and area stakeholders are engaged in efforts to identify key local concerns and aspirations, they typically identify cross-pillar issues, such as health, livelihood opportunities, safety and security, maintenance of valued traditions and relationships, extending their range of choices and gaining a reasonable level of independence and control.

*3. Integration of attention to effects at multiple levels, over time:* Some undertakings that may be subject to sustainability assessment are likely to affect only the people and ecosystems in the immediate vicinity raise only short term concerns. Most significant undertakings these days, however, have a broader range and period of influence. They may require imported materials and people, have downstream and downwind effects, generate provincial/territorial and national as well as local revenue flows, trigger or facilitate substantial development elsewhere, set a larger precedent of some sort, and/or have persistent or evolving effects, direct and indirect for many years, perhaps many generations.

For such cases, sustainability assessment processes, including their criteria and frameworks for evaluation and decision, must be designed to include and integrate local, regional,

national, perhaps even global considerations plus attention to future as well as more immediate effects. Capacity for such multiple level attention is one major advantage of sustainability assessment processes that combine generic sustainability criteria with case- and context-specific ones and focus on the long term as well as the short.

*4. Integration in seeking improvements:* Sustainability assessment is not just about ensuring attention to social, economic and ecological considerations, local circumstances and priorities, and their various interrelations over time. Its central objective is decisions that move us as quickly and fully as possible towards greater sustainability. It is therefore not enough to list attractive social, economic and ecological goals. Sustainability assessment criteria must be designed to demand the most positive steps towards meeting the key requirements for sustainability, recognizing that these requirements are linked and that responses to them should be mutually supportive.

Sustainability assessment of this sort is said to be “objectives” led, rather than focused on changes relative to the existing baseline (Pope et al, 2004). The difference between the two can be exaggerated. Improvements in the direction of greater sustainability are always improvements relative to existing conditions. The key questions are what improvements are most important and how much improvement should be expected in particular cases. Sustainability assessment criteria should define what is needed for progress in the right direction, and should identify the priorities – in general and in particular contexts. But how much improvement should be expected inevitably depends on what is possible as well as on what is desirable. And determining what is possible entails comparative evaluation of the reasonable alternatives. To ensure adequately positive decisions, sustainability assessment needs both comprehensive and demanding criteria, and careful comparison of the reasonable alternatives.

Appendix 1 provides summary outlines of an illustrative range of sustainability assessment approaches, including a variety of conceptual frameworks as well as some of the most advanced applied processes. A few have been designed for particular sectors or technologies, but most are intended for broad application at the planning and/or project level. Many more could be added (see, for example, the recent review of sustainability assessment initiatives by Dalal-Clayton and Sadler, 2005). Clearly, there is no single dominant approach and the existing options vary in some important ways. At the same time, however, the examples provided confirm the common adoption of explicit sustainability criteria, the predominance of approaches that include both general and case- and context-specific criteria, and widespread recognition of needs to go beyond reliance on the conventional social, economic and ecological categories. Several of the more sophisticated approaches also suggest means for dealing with trade-offs.

Generally and for the purposes of the Mackenzie Gas Project case, there is a firm foundation for building a framework for sustainability assessment combining generic and case-specific criteria. The generic criteria would consist of

- broadly applicable criteria that reflect the core requirements for sustainability generally, supplemented by
- additional criteria to guide the handling of possible trade-offs where there is unavoidable conflict between meeting one criterion and meeting another.

These would then be combined with and/or elaborated by

- efforts to identify the major concerns and priorities of the case and its context (locally, territorially and nationally).

The generic core requirements criteria would establish the overall scope of deliberations on the EIS and the proposed project. They would ensure that no major area of concern is overlooked and would be particularly important in guiding consideration of larger scale (national, continental,

global) factors. The case- and context-specific components would focus attention on the local and regional issues of greatest importance.

### ***Generic sustainability evaluation and decision criteria***

The core characteristics of sustainability-based assessment establish net gains as the basic objective. Ideally these involve multiple, mutually reinforcing benefits and avoidance of all potentially significant adverse effects. This begs questions, however, about what are the key benefits to be sought, and what adverse effects are especially to be avoided.

In many assessment processes these are treated as questions about significance – what should be judged to be a significant positive effect or a significant negative one? But judgements about the significance of effects are just some of the many difficult choices to be made in assessment processes (from broad decisions on process design and application to case-specific decisions on what purposes should define the scope of inquiry, what alternative responses are potentially reasonable, what participants should be involved, what details of design and effect should be examined, what proposal should be approved, accepting what compromises, under what terms and conditions, and followed by what provisions for monitoring, enforcement and adaptation).

All of these decisions reflect basic evaluation and decision criteria of some sort. The criteria may not be stated explicitly, and they may not be applied consistently throughout the process. But they are inevitably present and, for sustainability assessment, they should be both explicitly identified and consistently applied.

The core evaluation and decision criteria must clarify how to pursue the general goal of “contribution to sustainability.” As suggested above, they need to do so in ways that integrate

- considerations that are linked across the usual social, economic and ecological categories,
- universally-applicable imperatives and concerns specific to the case and context,
- issues and priorities interacting from the local to the global levels, and over time from the present to future generations, and
- attention to best options as well as improvements over base conditions.

The list of generic criteria in the Box 1, below, represents a synthesis of the main requirements for progress towards sustainability presented in the literature and tested in practice in sustainability implementation initiatives (including early sustainability assessments) over the past decade and a half. These criteria can be phrased and categorized in other ways and most of them are summarized too briefly here to convey all of the major considerations involved. But they should provide an adequate working foundation.

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### **Box 1: Basic Sustainability Assessment Decision Criteria**

#### **Socio-ecological system integrity**

the requirement

Build human-ecological relations to establish and maintain the long term integrity of socio-biophysical systems and protect the irreplaceable life support functions upon which human as

well as ecological well-being depends.

illustrative implications:

- need to understand better the complex systemic implications of our own activities
- need to reduce indirect and overall as well as direct and specific human threats to system integrity and life support viability

### **Livelihood sufficiency and opportunity**

the requirement:

Ensure that everyone and every community has enough for a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.

illustrative implications:

- need to ensure provision of key prerequisites for a decent life (which, typically, are not now enjoyed by those who have little or no access to basic resources and essential services, who have few if any satisfactory employment opportunities, who are especially vulnerable to disease, or who face physical or economic insecurity)
- need to appreciate the diversity, and ensure the involvement, of those whose needs are being addressed

### **Intragenerational equity**

the requirement:

Ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, etc.) between the rich and the poor.

illustrative implications:

- need to build sustainable livelihoods for all, including practically available livelihood choices and the power to choose
- need to emphasize less materially and energy intensive approaches to personal satisfactions among the advantaged, to permit material and energy sufficiency for all

### **Intergenerational equity**

the requirement:

Favour present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably.

illustrative implications:

- need to return current resource exploitation and other pressures on ecological systems and their functions to levels that are safely within the perpetual capacity of those systems to provide resources and services likely to be needed by future generations
- need to build the integrity of socio-ecological systems, maintaining the diversity, accountability, broad engagement and other qualities required for long term adaptive adjustment.

### **Resource maintenance and efficiency**

the requirement:

Provide a larger base for ensuring sustainable livelihoods for all while reducing threats to the long term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit.

illustrative implications:

- need to do more with less (optimize production through decreasing material and energy inputs and cutting waste outputs through product and process redesign throughout product lifecycles) to permit continued economic expansion where it is needed, with associated employment and wealth generation, while reducing demands on resource stocks and pressures on ecosystems
- need to consider purposes and end uses recognizing that efficiency gains are of no great value if the savings go to more advantages and more consumption by the already affluent

### **Socio-ecological civility and democratic governance**

the requirement:

Build the capacity, motivation and habitual inclination of individuals, communities and other collective decision-making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision-making practices.

illustrative implications:

- need governance structures capable of integrated responses to complex, intertwined and dynamic conditions
- need to mobilize more participants, mechanisms and motivations, including producers, consumers, investors, lenders, insurers, employees, auditors, reporters
- need to strengthen individual and collective understanding of ecology and community, foster customary civility and ecological responsibility, and build civil capacity for effective involvement in collective decision making

### **Precaution and adaptation**

the requirement:

Respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for surprise, and manage for adaptation.

illustrative implications:

- need to act on incomplete but suggestive information where social and ecological systems that are crucial for sustainability are at risk
- need to design for surprise and adaptation, favouring diversity, flexibility and reversibility
- need to prefer safe fail over fail-safe technologies
- need to seek broadly comprehensible options rather than those that are dependent on specialized expertise
- need to ensure the availability and practicality of backup alternatives
- need to establish mechanisms for effective monitoring and response

### **Immediate and long term integration**

the requirement:

Apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains.

considerations:

- integration is not the same as balancing
- because greater efficiency, equity, ecological integrity and civility are all necessary for sustainability, then positive gains in all areas must be achieved
- what happens in any one area affects what happens in all of the others
- it is reasonable to expect, but not safe to assume, that positive steps in different areas will be

mutually reinforcing

illustrative implications:

- need positive steps in all areas, at least in general and at least in the long term
  - need to resist convenient immediate compromises unless they clearly promise an eventual gain  
- from Gibson et al (2005)<sup>6</sup>
- 

## ***Guidance for handling trade-offs***

Sustainability has often been presented as a matter of balancing social, economic and ecological imperatives, as if it were a matter of spreading the sacrifices fairly all round. This is a mistake. The concept of sustainability is built on recognition that in the long haul social, economic and ecological viability and well-being are interdependent. We cannot maintain viable ecosystems where people are poor and desperate, or rich and rapacious. We cannot maintain viable economies where there is social chaos or degraded resources. And we cannot secure a desirable and durable future for our children by accepting further sacrifices of the foundations for sustainability. All of the sustainability requirements listed in Box 1 are necessary and all of them are connected to the others. If any one is neglected, progress towards sustainability is constrained and improvements in other requirements areas will be imperiled. Overall and wherever possible we must move ahead on all fronts. Compromises and trade-offs are a last resort.

In most individual cases, however, there will be compromises. Most significant undertakings, even ones that are highly desirable from a sustainability perspective, will have some negative effects or at least introduce some unwelcome risks. Sustainability assessment will not deliver perfection. It aims for net gains, multiple reinforcing benefits, minimal adverse effects and wise choices among our options. It accepts that trade-offs will sometimes be unavoidable.

The challenge is to ensure that trade-offs are minimized and that significant losses are accepted only where all the feasible alternatives are worse. In trade-off decision making much depends on the specifics – what particular conflicts emerge and what realistic options are available. Only a few general rules apply. They are set out in Box 2.

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### **Box 2: Basic Sustainability Assessment Trade-off Rules**

#### **Maximum net gains**

Any acceptable trade-off or set of trade-offs must deliver net progress towards meeting the requirements for sustainability; it must seek mutually reinforcing, cumulative and lasting contributions and must favour achievement of the most positive feasible overall result, while avoiding significant adverse effects.

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<sup>6</sup> An earlier version of this set of core sustainability assessment decision criteria, and of the following set of trade-off rules, was provided in a research paper (Gibson, 2002) prepared for and published by the Canadian Environmental Assessment Agency.

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### **Burden of argument on trade-off proponent**

Trade-off compromises that involve acceptance of adverse effects in sustainability-related areas are undesirable unless proven (or reasonably established) otherwise; the burden of justification falls on the proponent of the trade-off.

### **Avoidance of significant adverse effects**

No trade-off that involves a significant adverse effect on any sustainability requirement area (for example, any effect that might undermine the integrity of a viable socio-ecological system) can be justified unless the alternative is acceptance of an even more significant adverse effect.

- Generally, then, no compromise or trade-off is acceptable if it entails further decline or risk of decline in a major area of existing concern (for example, as set out in official international, national or other sustainability strategies or accords or as identified in open public processes at the local level), or if it endangers prospects for resolving problems properly identified as global, national and/or local priorities.
- Similarly, no trade-off is acceptable if it deepens problems in any requirement area (integrity, equity, etc.) where further decline in the existing situation may imperil the long term viability of the whole, even if compensations of other kinds, or in other places are offered (for example, if inequities are already deep, there may be no ecological rehabilitation or efficiency compensation for introduction of significantly greater inequities).
- No enhancement can be permitted as an acceptable trade-off against incomplete mitigation of significant adverse effects if stronger mitigation efforts are feasible.

### **Protection of the future**

No displacement of a significant adverse effect from the present to the future can be justified unless the alternative is displacement of an even more significant negative effect from the present to the future.

### **Explicit justification**

All trade-offs must be accompanied by an explicit justification based on openly identified, context specific priorities as well as the sustainability decision criteria and the general trade-off rules.

- Justifications will be assisted by the presence of clarifying guides (sustainability policies, priority statements, plans based on analyses of existing stresses and desirable futures, guides to the evaluation of 'significance', etc.) that have been developed in processes as open and participative as those expected for sustainability assessments.

### **Open process**

Proposed compromises and trade-offs must be addressed and justified through processes that include open and effective involvement of all stakeholders.

- Relevant stakeholders include those representing sustainability-relevant positions (for example, community elders speaking for future generations) as well as those directly affected.
- While application of specialized expertise and technical tools can be very helpful, the decisions to be made are essentially and unavoidably value-laden and a public role is crucial.

- from Gibson et al (2005)

Appendix 2 presents a simple framework that incorporates the basic sustainability assessment criteria and trade off rules with slight adjustment for application to undertakings such as the Mackenzie Gas Project. For illustrative purposes it lists more specific considerations under each criterion. Except perhaps for quick reviews of minor undertakings, this listing of key generic questions about effects and trade-offs is insufficient because it does not include case- and context-specific concerns. For the Mackenzie Gas Project case, such concerns are crucial.

### ***Elaboration of generic criteria for specific contexts: general approaches***

The generic criteria above provide a basic framework that covers the key sustainability issues and their interconnections. Use of these as the basic framework should ensure that no big common issues are neglected. The next step is to add in the key considerations that are specific to the case and its particular context.

Sustainability assessments can draw from a variety of sources to identify the major case- and context-specific considerations. These include

- existing policy and planning documents that set out key concerns and priorities at the local, regional, territorial and/or national level,
- considerations that emerged in prior assessments or similar processes dealing with the same context,
- earlier deliberations on the case, especially involving the key stakeholders, and
- other sources of local and/or larger scale information that sheds light on how the various generic sustainability concerns are reflected in the circumstances and issues of the particular case and context.

Any proposed listing of these case- and context-specific considerations should be open to public discussion, review and adjustment. The objective is to identify the key sustainability-related questions raised by the project and its context. While many of these can be identified by informed observers and assisted by specialized experts, the importance of issues is also a matter of public preference and choice.

There are four basic approaches to integration of the generic sustainability criteria with an identified set of case- and context-specific issues.

1. Use the core criteria as a basic framework and to elaborate the more specific questions under each of the criteria to reflect the case and context (e.g., by expanding the questions in the generic framework in Appendix 2 to incorporate all major issues particular to the particular case and context). This will work best where the evident categories of major issues fall relatively easily under generic sustainability criteria categories.
2. Use a list of major case and context issues as the basic framework and pose questions under each issue to reflect the core sustainability criteria.
3. Build a matrix with the generic sustainability criteria and elaborations along one axis and the key case and context issues along the other.

4. Construct a hybrid framework beginning with the big issues of the case and context, but integrating the major related sustainability criteria. In effect the generic sustainability criteria clarify and, where necessary, supplement the recognized case and context issues to ensure that all of the major sustainability considerations are included.

### ***Integration of generic criteria with major considerations for the Mackenzie Gas Project case***

While no one of these approaches is necessarily superior to the others, the final option is probably most suitable in the present case. Because of the long history of deliberations about resource extraction, pipelines and other influences on traditions and development possibilities in the Mackenzie Valley and the adjacent region, many of the major issues have been identified and discussed for decades and have become well entrenched as a framework for considering the present proposals and alternatives.

As we will see, the key sustainability issues raised immediately by the Mackenzie Gas Project case and its particular context overlap considerably but imperfectly with the generic sustainability criteria categories.

Given this, it makes most sense to proceed with the integration by taking the following steps:

- to begin with the recognized major case and context specific sustainability issues for the Mackenzie Gas Project assessment,
- to consider them in the light of the broader generic sustainability requirements/criteria, and
- to adjust the issues list by adding items or elaborations, as necessary, to ensure that all of the key generic as well as case-specific concerns are covered.

The following section collapses these steps together and considers the major sustainability issues for this case, using the evident major issues particular to the case and context as the basic framework but also including attention to the generic sustainability factors that apply everywhere.

### ***Major sustainability assessment issues for the Mackenzie Gas Project assessment***

In the Mackenzie Gas Project case today, the most immediate, major sources of case- and context-specific considerations are materials from the assessment and review work in this case so far. These include the agreement establishing the Panel (MVEIRB et al, 2004), the Panel's terms of reference (IGC et al, 2004), the Environmental Impact Statement submitted by the proponents (Imperial Oil et al, 2004), the subsequent information requests, submissions and deliberations on the adequacy/deficiency of the submitted EIS, and the report of the facilitator of the June 2005 conference on the sufficiency of information for the purposes of the hearings (Darling, 2005). These can, however, be supplemented by issues raised in broader public and expert comments on the project and its implications, persistent concerns and aspirations evident in the history of development proposals, initiatives and results in the Northwest Territories and northern Alberta, and the somewhat wider range of considerations linked to hydrocarbon and other resource projects in Canada.

The potential effects of the Mackenzie Gas Project depend most directly on the specific nature of the project design and implementation. But especially from a sustainability perspective, many of the lasting effects of the project, if approved, will be determined by the role that this limited term project has in establishing a foundation for viable livelihoods and other bases for continued wellbeing after its useful life is complete and the flow of gas and revenues ends. Inevitably, these lasting effects will be determined partly by the nature of project and the implementation behaviour of its proponents, and partly by the actions of other players and influences. These include, for example, the national and global political economy that affects hydrocarbon demand, the preparedness and intentions of the governments that receive project revenues and serve as regulators and service providers, and the range of other projects and activities that will contribute to cumulative effects, positive and negative.

Many of these contextual factors are established matters of concern for major resource exploitation undertakings generally. In northern Canada, including the Mackenzie Valley, the issues have been shaped by a long succession of economic ventures and associated activities that have brought transient as well as lasting gains, and disappointments as well as accomplishments. The history of the industrial economy of the project area and surrounding region has been typified by a succession of booms and busts – beginning with whaling and the fur trade, continuing through gold and other metal mining, and the periods of major hydrocarbon interest (beginning with Norman Wells and Canol spurts in the first half of the 20th century, coming again temporarily with the exploration efforts of the late 60s to mid to late 80s, and returning after a lengthy pause with the current pipeline proposal and recent gas demand expectations). The present proposal for a gas pipeline up the Mackenzie Valley also has several predecessors that raised expectations and concerns before being rejected or suspended.

It is no less significant that all of these undertakings have been carried out in, or at least proposed for, areas of traditional Aboriginal use and occupancy, and that the proponents have most often been chiefly guided by outside interests. The sustainability context of the proposal, and the resulting key issues, therefore include considerations centred on the interrelations of local, regional, national and other priorities, and on the past and future of the area as a homeland, or a resource frontier, or both.

For the Panel, and for stakeholders and authorities generally concerned with and responsible for decisions related to the Mackenzie Gas Project, the big questions can be grouped into two categories distinguished chiefly by scale. The questions in the first category are essentially about implications for and choices about the future of the people and communities of the Mackenzie Valley and northern Alberta that constitute the immediate project area. The second category of questions concerns the broader contributions, effects and implications of the project and its associated and induced activities for the larger region (especially the Northwest Territories and Alberta), for Canada and for the world.

For the people, communities and other interests in the project area, the issues include not only the project's immediate ecological and socio-economic effects, positive and negative, but also significant longer term questions about the nature and likelihood of substantial change in culture, economy and ways of life – towards greater self-reliance or dependency, solidarity or fragmentation, capacity for adaptation or vulnerability to decline.

For the broader set of potentially affected interests, in the project region and beyond, the key issues also centre on the project as a time-limited, non-renewable resource undertaking and its potential effects on regional, national and global futures. Here as in the immediate project area,

the main questions turn on the sustainability-related effects of the project – for example, how will the gains in revenues and learning during the life of the undertaking compare with the risks and damages (e.g., contributions to climate change), and how likely is it that the gains will be used successfully in ways that build the foundations for a more resilient, fair and durable future?

These categories are interrelated. How the revenue and other gains at the regional and national level are used will have substantial effects on the prospects for desirable and durable futures in the communities of the project area. Similarly, whether and how successfully the project helps to build a foundation for sustainable livelihoods in the project area communities will have long term effects on regional and national benefits or burdens.

Serious prospects for an overall positive contribution to sustainability clearly depend on whether the indirect and cumulative as well as direct effects of the project build longer term opportunities and capacities for sustainable livelihoods, communities and larger systems in the project area and beyond. Practically speaking, these sustainability-significant effects include not only those of the project as formally defined, but also the effects of the many other activities associated with or affected or induced by the project, or initiated in response to it and its effects. These include activities that would supply and service the pipeline, be attracted by the infrastructure and other enhancements that result from commencement of the project, use the gas delivered by the project, address health or security or other needs arising from the project, anticipate the end of project employment and revenue flows, or mitigate the residual damages.

Not all of these activities can be predicted in detail and with certainty. Many should meet the Terms of Reference test of “reasonably foreseen to be carried out” and their influence can be properly included under “cumulative effects” (IGC et al, 2004, p.58). Others – including those that will depend on the nature of the Panel’s recommendations concerning such matters as choice among alternatives and needed government program responses – might have to be considered as a range of possibilities or most reasonable assumptions in the circumstances. There will be no attempt here to identify the appropriate degree of Panel attention to each of these matters. The working objective is merely to identify the main categories of matters relevant to the Panel’s obligation to consider protection of existing and future well-being and its expressed commitment to assessing “contribution to sustainability”.

The following section collapses these steps together and presents the major sustainability issues for this case in two lists. The first list covers sustainability issues in the project area in the Northwest Territories and northern Alberta. The second list of issue areas and questions covers the broader regional, national and global context which will affect and be affected by the project. Both lists are designed also to integrate the generic sustainability criteria as they apply to the case and context.

In Appendix 3 the two lists will be consolidated with additional considerations including attention to trade-offs to provide an overall summary of the sustainability issues that could be used as a basis for establishing a sustainability assessment framework for the Mackenzie Gas Project case.

### **Sustainability issues in the project area**

The term “project area” is used in both the Agreement establishing the Mackenzie Gas Project assessment (MVEIRB et al, 2004) and in the assessment Terms of Reference (IGC et al, 2004) to include the area from the Mackenzie Delta to northern Alberta and the associated ecosystems,

communities and institutions that may affect and be affected by the proposed undertaking. The following list sets out the major categories of evident project area issues and associated questions.

As noted above, the categories and questions merge the generic sustainability concerns that apply in all cases with the evident issues that are specific to the Mackenzie Gas Project and its context. While the questions included under each category are meant to capture and illustrate the kinds of concerns involved, it is unlikely that they cover all of the significant issues and there is no assumption that the Panel or any other party would identify the listed questions as the most important ones to address. The intent is provide a useful basic structure and starting point for further discussion.

(i) *Ecosystems and traditional activities:*

Might the proposed construction of the pipeline, related infrastructure and associated and induced projects undermine the resilience of ecosystems and the continuation of traditional activities of the people and communities in the project area?

Beyond the associated and induced activities, what otherwise likely additional hydrocarbon exploration, extraction and transportation undertakings and other activities in the region might combine with the effects of the project on ecosystems and traditional activities?

How may continuing climate change affect the project and related activities and their effects on the ecology and communities of the project area?

What are the possibilities for and likelihood of lasting damage to ecosystem resilience and traditional activities from pipeline operations and other associated or induced activities?

How completely will the residual components, equipment and wastes of the project be removed, and how fully will negative effects be corrected by site rehabilitation or other initiatives, when the project ends?

Are the ecological systems and traditional activities surrounding the communities in the project area and larger region likely be to generally in better or worse shape after the project is over?

How might these prospects be different without the project or if some alternative were pursued instead of the project as proposed?

(ii) *Community well-being:*

What might be the positive and negative effects on community well-being – including livelihood security, diversity of opportunities, self-reliance, physical health, community solidarity and commitment, intergenerational relations, the distribution of employment and influence, cultural preservation and evolution – during pipeline construction, during operation and after decommissioning (taking into account the effects of associated and induced projects and activities as well as those of the project itself)?

Might these effects be positively or negatively reinforcing?

Are these effects likely to leave the communities more able or less able to deal with new possibilities and stresses in the future?

How might these prospects be different without the project or if some alternative were pursued instead of the project as proposed?

(iii) *Livelihoods (ways of making a living)<sup>7</sup>:*

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<sup>7</sup> The concept of sustainable livelihood has been discussed and applied for several decades. A standard definition is provided by Chambers and Conway (1992, pp.7-8):

a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes

What may be the overall effects on the maintenance and enhancement of livelihood foundations (e.g., available resources, applicable skills, knowledge of the land) and opportunities, including long term livelihood diversity and security in the communities of the project area and the larger region?

How might these prospects be different without the project or if some alternative were pursued instead of the project as proposed?

(iv) *Equity:*

Is the distribution of benefits and risks related to valued components of the ecological and/or socio-economic environment (e.g., jobs, access to resources and other means of livelihood security, opportunities for participation in traditional culture activities, and opportunities for participation in decision making affecting community and territorial life) in the communities of the project area and larger region likely to be more equitable or less equitable during project construction than it is now?

Is this distribution likely to be more equitable or less equitable during project operation than it is now?

Is this distribution likely to be more equitable or less equitable after the end of the project than it is now?

Is the end of the project (and associated activities including revenue flows) likely to leave future generations in the communities of the project area and larger region with better prospects or worse prospects than they would have had without the project?

How would these prospects be different if some alternative were pursued instead of the project as proposed?

(iv) *Resource access, use and efficiency*<sup>8</sup>:

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net benefits to other livelihoods at the local and global levels and in the long and short term.

Perhaps most significantly, this is a dynamic concept. Livelihood activities are expected to change in response to new opportunities, evolving preferences and outside pressures. Their sustainability depends on capacity to adjust as well as on maintenance of lasting foundations.

<sup>8</sup> Improvement in the net efficiency of energy and materials use (covering the full lifecycle from extraction to consumption/disposal/reuse) is a sustainability imperative at various scales. Globally, the efficiency challenge arises from a world in which billions of people are living in conditions of material insufficiency but current resource extraction is already about 20% beyond the planet's carrying capacity (WWF, 2004). In 1987, the World Commission on Environment and Development estimated that a five to tenfold increase in material production would be needed to raise conditions in developing countries to current industrial country standards and to meet the needs of an expanding human population (WCED, 1987, pp.213). To deliver this increase while reducing already unsustainable stresses on ecosystems and resources, we must achieve at least a five to tenfold increase in efficiency – ensuring a five to tenfold reduction in damage from extraction of resources, a five to tenfold increase in the per unit benefits from use of materials and energy, and a five to tenfold cut in the production of unnecessary residuals and the discharge of wastes (Weiszacker et al, 1997; Schmidt-Bleek, 2000). These improvements must be won largely through better design and practice in the multitudes of individual local initiatives that involve material and energy extraction and use. But it is not just a case of local initiatives contributing responses to a global problem. Efficiency gains can also provide important benefits for local purposes, including lower economic as well as ecological costs, better stewardship of renewable resources and longer life for exhaustible resource stocks, associated enhancement of livelihood security, and contributions to broader process improvements.

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Do the overall effects of the project in the project area and larger region promise any significant demonstration of or pressure for more efficient allocation and/or use of energy and other resources?

How effectively will requirements for energy and other resources and materials (water, gravel, lumber, pipe, equipment, etc.) be minimized, and how will the benefits of energy, resources and materials uses be maximized during construction, operation and decommissioning of the project? When the project is over, is actual and potential access to reliable energy sources (and other project-related resources and materials) in the communities in the project area and larger region likely to be more sustainable or less sustainable?

Might some alternative options, including not proceeding with the project now, or proceeding at a different rate or scale, do better?

(v) *Boom and bust:*

What may be the boom-bust effects during and after construction and during and after pipeline operation (taking into account associated and induced projects and activities as well as the pipeline project itself)?

What particular effects may result from the nature of and rises in revenue flows with the commencement of the project and the uses made of these revenues?

What particular effects may result from the decline in revenue flows with the end of the project, with special consideration of the activities that had been funded by these revenues?

What are the best estimates of induced and otherwise likely additional hydrocarbon exploration, extraction and transportation activities in the region, during and past the expected lifetime of the project and how might these affect the boom-bust effects of the project?

What practical means are available to extend the life of the project or more generally to extend the life of hydrocarbon extraction, transportation and related activities in the project area?

What are the local and regional risks of dependence on a temporary hydrocarbon-based economy?

How might these risks be minimized?

What are the possibilities that the project will trigger major consequential changes in the project area and what are the implications for these changes once the project is over?

Might some alternative options, including not proceeding with the project now, have more beneficial or less risky effects in the project area and larger region?

(vi) *Bridging:*

Given the temporary economic intensity of the pipeline construction, the longer but still limited period of hydrocarbon extraction and transportation, and the similarly limited period of associated revenue flows, what bridging efforts are planned to ensure that the immediate and medium term project benefits and opportunities will be used to secure lasting gains for the project area and larger region?

What are the grounds for confidence that these initiatives will be successful?

What longer term possibilities for sustainable livelihoods are anticipated and what programs and other initiatives are planned by the proponents and by the relevant government bodies to establish firm bridges to such livelihoods (in addition to dealing with existing concerns and with concerns anticipated during the life of the project)?

How might the anticipated or potential programs and other initiatives be affected by different assumptions about the size, direction and timing of revenue flows?

How might these prospects be different if some alternative were pursued instead of the project as proposed?

(vii) *Capacity to deal with expected demands:*

What does the project (plus the associated, induced and other concurrent projects and activities) expect or require of the capacity of community, territorial, provincial and other governance and service institutions to deal with existing and anticipated problems, needs and expectations in project area and larger region during project construction and operation?

What capacities are expected or required to deal with the end of the project?

What capacities are expected or required to deal with the transitions from project construction to operation and operation to post-project life?

How adequate are current plans for building the necessary capacities at the community, territorial and broader levels?

What would be different if some alternative were pursued instead of the project as proposed?

*(viii) Preparedness in the face of uncertainties:*

What does the project (plus the associated and induced projects and activities) expect or require of the preparedness of community, territorial and other governance and service institutions to ensure anticipatory design, and ongoing monitoring and adaptation during delivery, of socio-economic and ecological programs and other services, given uncertainties about possible effects during and after the end of the project?

How would the project (in construction, operation and after decommissioning) affect community and territorial preparedness for dealing with new situations, pressures and opportunities?

How would such preparedness be different without the project or if some alternative were pursued instead of the project as proposed?

*(ix) Timing, scale, pace and components:*

What are the overall long term advantages and disadvantages for the project area and larger region of proceeding now with the currently proposed project scale, pace and components, versus delaying the project, or proceeding with other possible timing, scale, pace and/or components?

*(x) Interactions among effects:*

How might the anticipated positive effects in the project area and larger region be mutually reinforcing and how might these mutually reinforcing effects be strengthened?

How might the anticipated negative effects (including risks) in the project area and larger region be mutually reinforcing and how might these reinforcing effects be mitigated or eliminated?

What trade-offs are unavoidable (what positive effects are not achievable without acceptance of some negative effects or risks)?

## **Sustainability issues beyond the project area**

The proposed undertaking will have effects beyond at the project area, and will be affected by territorial/provincial, national and global influences. This second list of issue categories and questions cover this broader context. As with the project area sustainability issues list, the categories and questions here merge generic sustainability and case specific concerns. And here again, the questions are unlikely to cover all of the significant issues or to fit any party's views about the most important issues to address. Along with the project area issue categories and questions, these are intended to provide a useful basic structure and starting point for further discussion.

*(i) Biophysical systems and associated human concerns:*

Might activities related to or induced by the project contribute to lasting effects on the seasonal habitats and/or movements of migratory species and the ecological relations and human activities dependent on them?

How may the project and associated and induced undertakings contribute to or detract from Canadian efforts to meet its commitments to reduce greenhouse gas emissions?

(ii) *Socio-economic well-being and livelihoods:*

From a regional and national perspective, are the project and the associated resources needed more now (taking into account the probable effect of the project on other hydrocarbon activities in the Northwest Territories and the expected use of the extracted and transported gas) than they might be in the future?

How are the project and associated and induced activities likely to affect and be affected by the anticipated demand for skilled employees in the hydrocarbon and pipeline construction sector in Canada?

Is proceeding with the project now likely to leave the region and Canada more able or less able to deal with new possibilities and stresses in the future?

How might these considerations be different if the project were delayed or if some alternative were pursued instead of the project as proposed?

(iii) *Equity:*

Is the project (along with associated and induced activities) likely to increase or decrease the equity of distribution of benefits and risks (e.g., employment opportunities, revenue flows and access to resources, service responsibilities, opportunities for participation in crucial decision making, and capacity to deal with emerging problems) in the region and in Canada?

Is this distribution likely to be more equitable or less equitable during project operation than it is now?

Is this distribution likely to be more equitable or less equitable after the end of the project than it is now?

Is the end of the project (and associated activities including revenue flows) likely to leave future generations in the region and in Canada with better prospects or worse prospects than they would have had without the project or if some alternative were pursued instead of the project as proposed?

(iv) *Resource access, use and efficiency*<sup>9</sup>:

What may be the regional and national effects on long term access to natural gas and other hydrocarbon resources?

Is the project (including consideration of the importance of the anticipated uses to which the extracted and piped resources may be put) likely to contribute positively or negatively to the efficiency of energy and materials use in the region, in Canada and beyond?

Could efficiencies in the product lifecycle – from initial extraction to end use – serve to increase the viable life of the project?

Do the overall effects of the project promise any significant demonstration of or pressure for more efficient allocation and/or use of energy and other resources in the region, in Canada and beyond?

Might some alternative options, including changes in project timing or scale, do better?

(v) *Boom and bust:*

Might any boom-bust effects during and after construction and during and after pipeline operation (taking into account associated and induced projects and activities as well as the pipeline project itself) have significant positive or negative effects beyond the project area and adjacent region?

Might the project, including the expected use of the delivered gas, exacerbate boom and eventual bust phenomena beyond the project area?

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<sup>9</sup> See note 8.

Might the end of the project leave deficiencies and problems that would have to be assumed by Canada and other authorities beyond the project area?

Might some alternative options, including not proceeding with the project now, have more beneficial or less risky effects?

(vi) *Bridging:*

What bridging responsibilities will need to be assumed by Canada and other authorities beyond the project area to secure lasting gains?

What preparations have been made to accomplish this?

Could bridging efforts in this case be developed as a model for similar efforts in other cases of temporary economic undertakings?

How might the anticipated or potential programs and other initiatives be affected by different assumptions about the size, direction and timing of the project and associated revenue flows?

How would these prospects be different if some alternative were pursued instead of the project as proposed?

(vii) *Capacity to deal with expected demands:*

What does the project (plus the associated and induced projects and activities) expect or require of the capacity of regional and national governance and service institutions to deal with existing and anticipated problems, needs and expectations?

What regional and national capacities are expected or required to deal with the end of the project?

How adequate are current regional and national capacities, considering also other current and anticipated demands for the relevant services?

What would be different if some alternative were pursued instead of the project as proposed?

(viii) *Preparedness in the face of uncertainties:*

What does the project (plus the associated and induced projects and activities) expect or require of the preparedness of regional and national governance and service institutions to ensure anticipatory design, and ongoing monitoring and adaptation during delivery, of socio-economic and ecological programs and other services, to deal with the surprises that are likely given the uncertainties about possible effects during and after the end of the project?

How would the project (in construction, operation and after decommissioning) affect regional and national preparedness for dealing with new situations, pressures and opportunities?

How would such preparedness be different without the project or if some alternative were pursued instead of the project as proposed?

(ix) *Timing, scale, pace and components:*

What are the regional and national advantages and disadvantages of proceeding now with the currently proposed project scale, pace and components, versus delaying the project, or proceeding with other possible timing, scale, pace and/or components?

(x) *Interactions among effects:*

How might the anticipated positive effects regionally and nationally be mutually reinforcing and how might these mutually reinforcing effects be strengthened?

How might the anticipated negative effects (including risks) be mutually reinforcing and how might these reinforcing effects be mitigated or eliminated?

What trade-offs are unavoidable (what positive effects are not achievable without acceptance of some negative effects or risks)?

## **Consolidation of sustainability issues involving both the project area and interests at the regional, national and/or global levels**

Because the Panel is reporting to national as well as local and regional authorities, distinguishing between issues at these two levels is likely to be useful. At the same time, it is important to recognize the substantial overlap between the major issues and related questions in and beyond the project area. Moreover, some factors are interdependent and must be considered together. For example, the nature and significance of project effects will depend not just on the particular capacities, preparedness and adaptability of the federal, territorial/provincial and local governance authorities, but also and perhaps more heavily on how well these authorities are set up to cooperate and reinforce each other's efforts. Similarly, when the Panel comes to address the need for the project, as required in its mandate, it will likely wish to consider current and anticipated needs, including long term sustainability implications, in the project area communities as well as those at a regional and national level.

Accordingly, a consolidated version of the two lists is provided as **Appendix 3**. For some purposes this might be more useful than the separate lists above. It will be for the Panel to decide how it wishes to organize its inquiries and report and where the separate or more consolidated approaches to project area and broader regional, national and global sustainability issues might be most useful.

## **Additional considerations: sources of answers, responses to uncertainty and recognition of interconnections**

All of these issue areas and questions are important for the Panel's assessment of the proposed project and its potential contribution to sustainability. However, not all of the questions are best posed to the proponent. In many cases, answers will depend at least in part on the preferences and plans of other parties. For example, the nature and allocation of revenue flows will depend in part on agreements made by the proponent, government and community authorities. And the relevant government and community bodies will be best equipped to discuss their preparations and commitments for use of the anticipated revenues, including in efforts to foster the desired bridging effects noted above.

In most areas, there may be important questions for which the relevant predictions of likely or possible activities and effects cannot be offered with much confidence. Sometimes general information will be adequate for decision purposes. Where more a precise understanding would have been desirable, the uncertainty problem must be faced openly, but uncertainty cannot be accepted as grounds for neglecting important issues. Uncertainties should always be noted; predictions should be accompanied by estimates of the confidence involved and the implications (e.g., need for back-up options) should always be identified. Where the uncertainties are great, efforts to anticipate and prepare are important. Indeed, sometimes the areas of greatest future uncertainty are the ones where we should be working hardest now to design for surprise and adjustment.

Perhaps for each big question area, there are four key things to be identified:

- what has been predicted (and with what level of confidence) with particular attention to the long term?
- what is or may be at risk?
- how might these effects interact with other possible effects, positive and negative?

- what are the approval, design and/or management implications?

For sustainability assessment purposes, however, it is also crucial to treat the issues and answers as interrelated. As noted above, the contribution-to-sustainability objective is to maximize mutually reinforcing positive effects while avoiding negative effects, especially those that might undermine the gains and combine to form a downward spiral of damages. That is why the final issue area in both lists above and a key concluding component in the consolidated list in Appendix 3 centres on how the effects may interact positively, negatively or as trade-offs.

### ***Dealing with trade-offs in the Mackenzie Gas Project case***

Taken as an interconnected package, the answers to the sustainability questions set out above should cover the essential issues relevant to Panel judgements on the matters at the centre of its responsibilities, including assessment of the project's potential contribution to sustainability. By themselves, however, answers to the key questions listed above will not be sufficient.

The lists of issues and questions include no indication of priorities. Where undisputed positive effects are anticipated and no alternative option promises better results, the relevant priorities might be obvious. But such circumstances are not likely to be common. Especially where trade-offs are involved, assessment requires judgements about what is most important in the context.

All of the generic sustainability criteria discussed above (Box 1) are based on requirements for progress towards sustainability. Overall and in principle in all cases, positive effects in every one of these requirement areas is needed. Unfortunately, in the highly imperfect world of particular cases and contexts, trade-offs are usually unavoidable.

The choice among competing options with different sets of trade-offs, must be made in light of specific priorities that depend on the realities to be faced (e.g., the extent of existing ecological stresses, the vulnerability of traditions, the need for more livelihood opportunities, and the immediate and long term availability of other options) and the preferences of those affected and concerned.

The generic trade-off rules set out above (Box 2) provide some guidance for the necessary decision making, including priority setting. The rule against displacement of significant adverse effects from the present to the future, for example, is fundamental for sustainability and provides a necessary protection for those interests that cannot be represented in present deliberations. But most of the others turn on how the trade-off decision making should proceed (e.g., with the burden of argument falling on the proponent of the trade-off, and with explicit rationales provided in open processes for all trade-off proposals), or depend on the particulars of the case (e.g., discouragement of further damage in or risk to major areas of existing concern).

For the Mackenzie Gas Project case, proper consideration of trade-offs would entail:

- recognition of the requirements for progress towards sustainability;
- identification of major recognized areas of concern relevant to potential project effects,
- identification of priorities for protection and improvement (chosen in light of the generic sustainability criteria and the current and anticipated conditions in the areas where project effects might be felt);
- identification of all proposed and implicit trade-offs, and the rationales provided for them;

- rejection of all trade-offs that would displace a significant adverse effect from the present to the future (unless the alternative is displacement of an even more significant negative effect from the present to the future);
- open deliberations on what other trade-offs might be acceptable, in light of other options; and
- final judgements and recommendations reflecting the public deliberations and accompanied by explicit rationales for each potentially significant trade-off.

### ***A sustainability assessment framework for the Mackenzie Gas Project case***

The sustainability issues lists and trade-off considerations outlined above integrate generic requirements and rules that apply in any sustainability assessment with recognition of the particular context of the project under review. Together, these sustainability issues lists and trade-off considerations constitute a basic working framework for sustainability assessment in the Mackenzie Gas Project case.

The framework is no doubt far from perfect. The lists of sustainability issues provided here may well be incomplete and there may be many more issues worthy of careful attention. Perhaps there are good reasons for adjusting the issue categories or even for adding new ones. Certainly the Panel and other participants in the review will need to go well beyond what is provided here in determining what matters deserve most careful examination, where the greatest current challenges lie, what are the priorities among the sustainability requirements in this case, and what more specific criteria should guide judgements about unavoidable trade-offs.

The framework does, however, cover the main sustainability and trade-off issues as identified in international study and experimentation with sustainability requirements and approaches to sustainability assessment. And it at least illustrates how the generic lessons can be integrated with case and context specific concerns to guide this assessment review. The results should help the Panel determine

- how the purpose of the project should be understood from the perspective of the local, regional and national interest in progress towards sustainability;
- whether and to what extent the project is needed;
- which effects are likely to be, or might be, most significant, given sustainability objectives;
- where important opportunities or perils have been missed and how current proposals and preparations need to be improved to ensure appropriate enhancements and mitigations
- what trade-offs may be acceptable (or least unacceptable)
- whether the project as proposed is the best option, in light of other alternatives including alternative means of carrying out the project;
- whether and under what terms and conditions it should be approved;
- what preparations by various parties are necessary and desirable to ensure that negative effects are avoided or mitigated, that unanticipated effects are identified and addressed quickly, and that maximum mutually reinforcing gains are achieved.

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**Appendix 1 Selected sustainability assessment approaches, criteria and processes**

Source	Assessment approach characteristics
<p>International Council for Local Environmental Initiatives (ICLEI, 1996, 2004) and ICLEI-Europe (1997), Local Agenda 21 (LA21) campaign, various versions of a participatory planning process for communities, applied to over 6000 cities, globally</p>	<ul style="list-style-type: none"> <li>• In the current version, municipal councils commit to reaching five milestones:               <ul style="list-style-type: none"> <li>- establish a multi-sector stakeholder group to oversee the LA21 process, consisting of representatives from all sectors of the community, that will be formally involved in the development and implementation of all actions aiming at the achievement of the LA21 Campaign milestones;</li> <li>- with the active participation of the LA21 stakeholder group, complete a sustainability audit considering social, economic, and environmental conditions and trends in the community;</li> <li>- complete a sustainable community vision for the future, based on community review of the audit and assessment of priorities;</li> <li>- implement an LA21 action plan, identifying clear goals, priorities, measurable targets, roles and responsibilities, funding sources, and work activities;</li> <li>- establish community-based monitoring and annual evaluation and community progress reporting on performance in achieving the LA21 action plan, using locally appropriate indicators.</li> </ul> </li> <li>• ICLEI-Europe (1997) sets out performance criteria based on ten steps:               <ul style="list-style-type: none"> <li>- set-up of a stakeholder group or “Local Agenda 21 Forum”</li> <li>- community consultation</li> <li>- agreement on a vision for the sustainable development of the community</li> <li>- review of existing plans and strategies concerning the future development of the community</li> <li>- development of sustainability indicators</li> <li>- sustainable development/management audits</li> <li>- definition of targets and priority setting</li> <li>- reporting and controlling mechanisms</li> <li>- link the local perspective to the global dimension</li> <li>- adoption of the Local Agenda 21 by the city council</li> </ul> </li> </ul>
<p>British Columbia's (1996) Growth Management Strategies law and process for pursuit of sustainability through preparation of planning strategies by municipalities in expanding urban</p>	<p>Process for establishing and implementing regional growth strategies in areas facing significant growth pressures:</p> <ul style="list-style-type: none"> <li>• each regional growth strategy to act as a planning framework for growth management by municipalities within the region following a 20 (or more) year vision</li> <li>• 14 legislated objectives for all growth strategies, setting out an implicit sustainability agenda:               <ul style="list-style-type: none"> <li>(a) avoiding urban sprawl and ensuring that development takes place where adequate facilities exist or can be provided in a timely, economic and efficient manner</li> <li>(b) settlement patterns that minimize the use of automobiles and encourage walking, bicycling and the efficient use of public transit</li> <li>(c) the efficient movement of goods and people while making effective use of transportation and utility corridors</li> </ul> </li> </ul>

<p>regions</p>	<p>(d) protecting environmentally sensitive areas            (e) maintaining the integrity of a secure and productive resource base, including the agricultural and forest land reserves            (f) economic development that supports the unique character of communities            (g) reducing and preventing air, land and water pollution            (h) adequate, affordable and appropriate housing            (i) adequate inventories of suitable land and resources for future settlement            (j) protecting the quality and quantity of ground water and surface water            (k) settlement patterns that minimize the risks associated with natural hazards            (l) preserving, creating and linking urban and rural open space including parks and recreation areas            (m) planning for energy supply and promoting efficient use, conservation and alternative forms of energy            (n) good stewardship of land, sites and structures with cultural heritage value</p> <ul style="list-style-type: none"> <li>• specification of more particular goals and priorities to fit local circumstances and objectives through the strategy development process</li> <li>• process centred on discussions, analyses and negotiations among participating municipalities to reach agreement on the contents of a regional growth management strategy that will provide the basis for subsequent adjustment of more specific municipal plans</li> <li>• formal requirements for public consultation plans and for public hearings on draft regional growth strategies</li> <li>• common use of alternative growth management option scenarios, impact analyses, sectoral studies and multistakeholder consultations (Boyle et al, 2003)</li> <li>• legislated provision of a series of increasingly firm means of resolving conflicts between participating municipalities concerning contents of the regional growth strategy</li> <li>• application through provincial-regional implementation agreements and requirements for compliance by municipal official community plans</li> </ul>
<p>Sadler's (1996, pp183-221) approach to sustainability assessment as next-generation environmental assessment</p>	<p>Evolution of environmental assessment in jurisdictions with broadly scoped strategic and project level assessment, established framework of sustainability policy commitments and application of other integrated policy tools:</p> <ul style="list-style-type: none"> <li>• focus on sustainability assurance rather than impact minimization</li> <li>• application of six key sustainability principles:               <ul style="list-style-type: none"> <li>- precautionary principle (err on the side of conservation as a hedge against irreversible or highly damaging changes)</li> <li>- anticipate and prevent rather than react and cure</li> <li>- stay within source and sink constraints (resource use/harvest with regenerative capacity; pollution/waste output within assimilative capacity)</li> <li>- maintain natural capital and or near current levels (no aggregate/net loss or drawdown of resource stocks or ecological diversity)</li> <li>- avoid conversion of land use from less intensive to more intensive uses</li> <li>- polluter-pays principle (full costs for environmental damage must be borne by users, e.g., industry and consumers)</li> </ul> </li> <li>• explicit attention to trade-offs and compensation issues, with emphasis on</li> </ul>

	<p>overall maintenance of natural capital</p> <ul style="list-style-type: none"> <li>• centred on environmental sustainability, but with recognition of economic and social equity dimensions</li> </ul>
<p>Becker's (1997) review of sustainability assessment values, concepts and methodological approaches</p>	<p>Generic sustainability assessment process (though designed with agricultural undertakings in mind):</p> <ul style="list-style-type: none"> <li>• initial process focus on the value of the environment (recognizing debates about the monetization of nature), intergenerational equity and intragenerational equity</li> <li>• next step: measurement (recognizing complex system context, risk, uncertainty and ignorance) with indicators either measuring single factors and combining them or representing complex processes, trends or states</li> <li>• application of explicit criteria for selection of sustainability indicators</li> <li>• selection among possible approaches (use of economic, social, ecological and composite indicators in lists without aggregation; use of scoring system approaches; focus on system properties; focus on ecosystem health)</li> <li>• identification of short and long term, and local and global goals</li> <li>• consideration of process options (use of expert opinion, participative/discursive approaches, etc.)</li> </ul>
<p>Basic approach to integration of sustainability into assessment requirements, proposed by Lawrence (1997)</p>	<p>Basic elements for design/application of a sustainability assessment process or specific sustainability assessments:</p> <ul style="list-style-type: none"> <li>• generic sustainability principles for general direction (e.g., identification of undertakings worthy of assessment)</li> <li>• more specific objectives or sustainability imperatives, including examination of alternative scenarios, adapted to different activity and environment types</li> <li>• explicit consideration of sustainability in purpose, principles and priorities</li> <li>• provisions for application to various types, scales, combinations of undertakings</li> <li>• application of sustainability considerations in examination of broadly defined environmental conditions, effects, effects management options (mitigation and enhancement)</li> <li>• effective public involvement, including in conflict resolution</li> <li>• coordination with deliberations of related stakeholders and authorities</li> <li>• integration with other related processes (planning, management, etc.)</li> </ul>
<p>Assessing the Sustainability of Societal Initiatives and Proposing Agendas for Change (ASSIPAC) method for sustainability assessment, designed chiefly for urban planning uses,</p>	<p>Two-stage sustainability-centred process for review of proposed initiatives: an initial screening or “check” and a more detailed examination in cases where the screening uncovers possible conflicts with established sustainability objectives</p> <ul style="list-style-type: none"> <li>• initial checklist includes attention to existing sustainability policies or strategies, any identified alternatives, best international practice for initiatives of the sort proposed, public/stakeholder views, barriers to more sustainable design in the case, integrated attention to sustainability in design of the initiative, linkages between the proposed initiative and other activities and opportunities, precautionary characteristics, empowerment of the local community, and attention to a set of environmental, socio-cultural and economic considerations.</li> <li>• environmental considerations: relation to carrying capacity of the region</li> </ul>

<p>but broadly applicable (Devuyst, 1999)</p>	<p>inclusion of an environmental case system in the initiative          limited use of natural resources          limited use of materials and production of waste          protection of biodiversity          limited pollution          restoration and maintenance of ecological cycles          greenhouse gas implications          influence on population growth</p> <ul style="list-style-type: none"> <li>• social and cultural considerations:             <ul style="list-style-type: none"> <li>empowerment of groups in the community</li> <li>limitation of social polarization</li> <li>strengthening local cultural identity and diversity</li> <li>protection and improvement of health</li> <li>improvement of possibilities for education and training</li> <li>improvement of possibilities for local employment</li> <li>increase in possibilities for socio-cultural/recreational exchanges</li> <li>encouragement of sustainable lifestyle</li> <li>strengthening of democratic community values</li> <li>strengthening of local community independence</li> </ul> </li> <li>• economic considerations             <ul style="list-style-type: none"> <li>strengthening and diversifying local economy</li> <li>encouraging and supporting private entrepreneurship</li> <li>supporting environmentally conscious and ethically responsible trade</li> </ul> </li> <li>• planning and design considerations             <ul style="list-style-type: none"> <li>promotion of development patterns that reduce material/energy demands</li> <li>promotion of development patterns that respect ecosystem functions</li> </ul> </li> <li>• reliance on general sustainability principles and objectives if specific ones not available</li> <li>• report on application of checklist to inform decision makers and stakeholders</li> <li>• more detailed ASSIPAC study local/regional vision must be prepared for case if not available already as baseline for analysis</li> <li>• both screening and detailed reviews require expert and independent assessors</li> <li>• strong emphasis on a sustainability vision/strategy as a foundation for judgements, plus larger context of indicator development, auditing and reporting (Devuyst et al, 2001)</li> <li>• general considerations do not all fit comfortably in the three main categories</li> <li>• appears designed to apply after an initiative has been prepared and proposed but could influence earlier conceptualization and planning if established as a regular process requirement for approvals</li> </ul>
<p>United Kingdom (UK, 1999a) strategy for sustainable development</p>	<ul style="list-style-type: none"> <li>• Four objectives:             <ul style="list-style-type: none"> <li>- social progress that recognizes the needs of everyone</li> <li>- effective protection of the environment</li> <li>- prudent use of natural resources, and</li> <li>- maintenance of high and stable levels of economic growth and employment.</li> </ul> </li> <li>• Ten guiding principles/approaches:             <ul style="list-style-type: none"> <li>- putting people at the centre</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>- taking a long term perspective</li> <li>- taking account of costs and benefits</li> <li>- creating an open and supportive economic system</li> <li>- combating poverty and social exclusion</li> <li>- respecting environmental limits</li> <li>- the precautionary principle</li> <li>- using scientific knowledge</li> <li>- transparency, information participation and access to justice</li> <li>- making the polluter pay</li> <li>• Implementation through             <ul style="list-style-type: none"> <li>- new bodies (cabinet committee, House of Commons environmental audit committee, Sustainable Development Commission)</li> <li>- more integrated appraisal system covering environmental, economic, safety, and other factors</li> <li>- initiatives in health, transportation, aggregates mining, regional development, etc.</li> <li>- use of broader range of instruments, including ecological tax reform</li> <li>- regional sustainable development frameworks, Local Agenda 21 strategies and planning system reform</li> <li>- annual reporting of progress in light of 15 headline indicators and full set of 147 indicators (UK, 1999b)</li> </ul> </li> </ul>
<p>Integrated sustainable cities assessment method (ISCAM), proposed in light of case review of integrated planning for sustainability for Greater Manchester (Ravetz, 2000)</p>	<p>An integrated complex systems framework approach to urban and regional planning centred on use of an accounting tool providing a means of examining trends, targets and alternative scenarios</p> <ul style="list-style-type: none"> <li>• respects technical indeterminacy and value multiplicity</li> <li>• focuses on upstream and downstream flows (e.g., from drivers such as values and needs through various activities, products and services, to outcomes and externalities) including information as well as materials and recognizing feedbacks and other linkages as well as linear phenomena, plus attention to system influences from the national and global to the local and back</li> <li>• presumes value of core accounts but also need for deliberation on more complex factors and relationships</li> <li>• requires, even for the core accounts, selection of values, key baselines and trends, scenario alternatives to business as usual, and anticipated change factors</li> <li>• presumes use as a tool contributing to the larger context of initiatives to clarify visions, scenarios and options for action (including examination of barriers and constraints, responses in strategies, policies, programs and projects)</li> <li>• presumes continued evaluation and adjustment</li> </ul>
<p>United Kingdom approach to sustainability appraisal, chiefly used by planning authorities in the preparation of regional plans,</p>	<p>Broadly applicable general assessment process, used in the UK since 1998 for sustainability-centred appraisals of work done in successive steps of regional planning:</p> <ul style="list-style-type: none"> <li>• evolved from strategic environmental assessment/appraisal in the development planning process</li> <li>• implemented through guidance documents rather than specified mandatory obligations</li> <li>• adopts general sustainability principles and related indicators from UK</li> </ul>

<p>but also used to inform decisions on other initiatives and to guide performance reviews of existing policies, activities and projects (UK DETR, 2000a; Counsell and Haughton, undated)</p>	<p>sustainability strategy (UK, 1999a) but relies heavily on efforts to characterize the particular region's current conditions and set region-specific sustainability objectives (UK DETR, 2000b)</p> <ul style="list-style-type: none"> <li>• appraisals done in parallel with, and to inform, the typical steps in regional plan preparation: setting planning objectives, identifying and evaluating development options, drafting development policies and the regional development plan</li> <li>• these steps followed by reviews by senior government, public and hearing panel and decision by senior government</li> <li>• appraisal may also be done of the final plan and is meant to continue during plan implementation with contributions of indicators for auditing of monitoring results</li> <li>• common use of scoring methods including identification of anticipated positive, negative or uncertain effects on achievement of selected objectives</li> <li>• important roles in fostering policy integration (ensuring attention to economic, social and environmental policy concerns) and linking regional and national strategies</li> <li>• reported challenges in encouraging enough commonality of objectives and indicators to permit inter-regional comparisons, in ensuring evaluation of alternative development options, in integrating attention to different sustainability considerations and dealing with conflicts and trade-offs, in ensuring sustainability appraisals are influential in planning decision making, in ensuring timely public access to appraisal documents and more generally in opening up the planning and appraisal process to more effective scrutiny (Counsell and Haughton, undated)</li> </ul>
<p>IUCN (World Conservation Union) sustainability assessment method for evaluating human and environmental conditions progress towards sustainability (Guijt et al, 2001)</p>	<p>Two pillar approach centred on ecosystem well-being and human well-being, applied to sustainability evaluation</p> <ul style="list-style-type: none"> <li>• focus on evaluation of conditions and progress</li> <li>• intended also to complement strategic and project level decision making by providing a framework for information gathering and interpretation</li> <li>• human well-being distinguished from wealth and defined as “a condition in which all members of society can determine and meet their needs, from a range of choices”</li> <li>• ecosystem well-being defined as “a condition in which the ecosystem maintains diversity and quality, its capacity to support all life, and its potential to adapt to change to provide future options”</li> <li>• “egg of well-being” depiction of people as yolk within the ecosystem</li> <li>• seven stage process with initial work to develop a shared vision of sustainability, leading to more specified objectives, indicators and performance criteria, followed by assessment using and combining the indicators, and considering implications</li> <li>• standard suggested indicators but context-specific emphasis and reliance on a participatory process involving relevant stakeholders</li> <li>• human and ecosystem well-being factors measured separately, to allow “progress in human development and ecosystem conservation to be compared”</li> <li>• indicators jointly presented on two axes of matrix (barometer of sustainability)</li> <li>• tested in case applications including ones in Zimbabwe and India</li> <li>• apparently not strong on system interactions</li> </ul>

	<ul style="list-style-type: none"> <li>• offers contextual information for trade-off decisions but no assessment process guidance</li> <li>• not sustainability assessment as an approach to strategic or project decision making</li> </ul>
<p>Mining, Minerals and Sustainable Development project (MMSD, 2002, p399) outline of basic components of integrated impact assessment (itself to be integrated in a broader framework of initiatives and tools from the global level to the community level)</p>	<p>A combination and integration of environmental impact assessment with supplementary social and other appraisals, which should</p> <ul style="list-style-type: none"> <li>• cover all significant social, economic and environmental issues</li> <li>• be applied to all new projects</li> <li>• include early consultation with relevant community to identify local concerns</li> <li>• be designed to address full set of sustainability issues and local concerns even if beyond legislated requirements</li> <li>• be an inclusive, dynamic, ongoing process of integrating knowledge of impacts into decision making and practice</li> <li>• be endorsed by community and government</li> <li>• include independent monitoring of impacts</li> <li>• be linked to development of a community sustainable development plan, integrated plan for closure, including efforts to sustainable benefits after closure</li> </ul>
<p>North American working group of the Mining, Minerals and Sustainable Development project (MMSD-NA, 2002), sustainability assessment framework for mining undertakings</p>	<p>Seven questions to guide sustainability assessments of the full life-cycle of mining projects (complemented by further specification of objectives, indicators and metrics):</p> <ul style="list-style-type: none"> <li>• are engagement processes in place and working effectively?</li> <li>• will people's well-being be maintained or improved?</li> <li>• is the integrity of the environment assured over the long term?</li> <li>• is the economic viability of the project or operation assured, and will the economy of the community and beyond be better off as a result?</li> <li>• are traditional and non-market activities in the community and surrounding area accounted for in a way that is acceptable to the local people?</li> <li>• are rules, incentives, programs and capacities in place to address project or operational consequences?</li> <li>• does a full synthesis show that the net result will be positive or negative in the long term and will there be periodic reassessments?</li> </ul>
<p>Hong Kong sustainability assessment system, for integrated consideration of proposals (HK SDU, 2002)</p>	<p>Checklist-based system of pre-decision review of proposals for new strategic initiatives and major programs, integrating attention to economic, social and biophysical factors</p> <ul style="list-style-type: none"> <li>• initiated 2001</li> <li>• meant to facilitate early identification of potentially significant, controversial and/or cross-sectoral issues, and negotiated resolution of conflicts</li> <li>• eight guiding principles related to issue areas: economy, health and hygiene, natural resources, society and social infrastructure, biodiversity, leisure and cultural vibrancy, environmental quality and mobility</li> <li>• 39 quantifiable indicators (included in computer-aided evaluation tool), plus expectation of evaluation of non-quantifiable factors</li> <li>• process steps: set out proposal objectives/assumptions; evaluate positive</li> </ul>

	<p>and negative implications through checklist application (plus non-quantifiable considerations); consider alternatives; prepare report on key findings</p> <ul style="list-style-type: none"> <li>• emphasis on involvement of community groups and non-government organizations</li> <li>• guidance unit based in central administration bureau</li> <li>• complemented by work of a Council for Sustainable Development, a Sustainable Development Fund for support of community initiatives that integrate consideration of sustainability issues.</li> </ul>
<p>Bradley et al (2002) use of sustainability criteria to evaluate onsite wastewater treatment technologies</p>	<p>Evaluation and decision making framework designed specifically for assessment of technology and management options for onsite wastewater treatment:</p> <ul style="list-style-type: none"> <li>• initial identification of general social, economic and environmental criteria for any wastewater treatment evaluation with consideration of quantifiability in long term indicators/performance measures</li> <li>• incorporation of site-specific factors by weighting of sustainability criteria according to values of relevant specific communities (social, economic and environmental) on a 1 to 10 scale</li> <li>• comparative scoring/evaluation of conventional and alternative wastewater treatment and management options (no absolute score for sustainability)</li> <li>• identification of benefits and shortcomings</li> <li>• identification of responses to shortcomings through alternative technologies and management approaches using same criteria</li> <li>• consideration of costs and risks</li> <li>• identification of barriers to improvement and possible responses</li> <li>• recognition of links between site-specific option evaluation and larger issues (e.g., implications for housing density, availability of management support)</li> </ul>
<p>Stockholm Environment Institute (Maltais et al, 2002) sustainability assessment of World Trade Organization negotiations in the food crops sector</p>	<p>An applied sustainability assessment of food sector trade liberalization options/effects using case studies of eight selected countries and focusing on two major crops (wheat and edible oils):</p> <ul style="list-style-type: none"> <li>• initial review of economic, social and environmental considerations and key sustainability issues in sector for each case</li> <li>• assessment of changes in structure of economic incentives and opportunities, production system characteristics and sustainability aspects</li> <li>• comparisons of baseline, liberalization and intermediate scenarios</li> <li>• evaluation of potential policy responses and their implications</li> <li>• consideration of positive, negative and ambiguous effects</li> <li>• key sustainability effects include changes in water quality/quantity, land conversion, soil degradation, national income, employment, rural poverty/livelihoods, and equality</li> <li>• identification of key sustainability issues: budgetary expenditure, consumer prices, rural livelihoods and equity, rural landscape and biodiversity, water quality, soil degradation</li> <li>• identification of key trade off issues, including broadly distributed benefits competing with more focused adjustment costs</li> <li>• identification of analytical problems, including aggregation of findings when sustainability conditions and impacts are diverse and context specific, and when aggregation obscures important details such as significant</li> </ul>

	positive or negative effects on particular groups (e.g., the very poor).
<p>Equator Principles (2003) for decision making on major project financing, prepared and adopted by a voluntary association of major financial institutions for assessment environmental and social risk of proposed projects expected to cost over US\$50 million</p>	<p>Financial institution commitment to specified information requirements covering a range of ecological and social matters as a complement to traditional financial considerations:</p> <ul style="list-style-type: none"> <li>• where risk is potentially significant, the borrower must have completed an assessment report addressing             <ol style="list-style-type: none"> <li>a) assessment of the baseline environmental and social conditions</li> <li>b) requirements under host country laws and regulations, applicable international treaties and agreements</li> <li>c) sustainable development and use of renewable natural resources</li> <li>d) protection of human health, cultural properties, and biodiversity, including endangered species and sensitive ecosystems</li> <li>e) use of dangerous substances</li> <li>f) major hazards</li> <li>g) occupational health and safety</li> <li>h) fire prevention and life safety</li> <li>i) socioeconomic impacts</li> <li>j) land acquisition and land use</li> <li>k) involuntary resettlement</li> <li>l) impacts on indigenous peoples and communities</li> <li>m) cumulative impacts of existing projects, the proposed project, and anticipated future projects</li> <li>n) participation of affected parties in the design, review and implementation of the project</li> <li>o) consideration of feasible environmentally and socially preferable alternatives</li> <li>p) efficient production, delivery and use of energy</li> <li>q) pollution prevention and waste minimization, pollution controls (liquid effluents and air emissions) and solid and chemical waste management</li> </ol> </li> <li>• no indication of overall objectives or process for consideration of trade-offs</li> </ul>
<p>Comprehensive sustainability assessment framework proposed by Jenkins et al (2003) to the Western Australia State Sustainability Assessment Working Group, created in response to an anticipated sustainability assessment commitment in</p>	<p>A comprehensive approach to strategic and project level assessment and decision making:</p> <ul style="list-style-type: none"> <li>• designed to fit in the context of a broader framework for sustainability-oriented governance, including regular status of sustainability reporting, a state sustainability strategy, regional sustainability strategies and action plans, agency sustainability action plans, sustainability performance auditing</li> <li>• regime to be built on expansion of existing environmental impact assessment regime, with insights also from integrated regional planning</li> <li>• concurrent environmental, social and economic impact assessments to be completed by proponents and reviewed by government bodies, with opportunity for public comment</li> <li>• reviews to be completed and submitted separately as advice to the political level (through a sustainability co-ordinator in the cabinet office) where integration and trade-offs are to be addressed</li> <li>• proposals to be assessed in light of sustainability criteria identified in the development of regional sustainability strategies (an expansion of regional land use planning)</li> </ul>

<p>the 2002 State Sustainability Strategy Consultation Draft</p>	<ul style="list-style-type: none"> <li>• assessment results to feed back into revisions/adaptations of regional strategies and action plans</li> <li>• assessment decisions to include approval conditions for proponents and action requirements for non-proponents (e.g., government agencies)</li> <li>• appears to assume application to already initiated proposals</li> <li>• no discussion of approach to alternatives</li> <li>• dedication to political level control over trade-offs may limit effective integration of consideration in planning and proposal development by proponent</li> </ul>
<p>Strategic environmental assessment for sustainability appraisal of Ghana's Poverty Reduction Strategy (Nelson et al, 2004)</p>	<p>Concurrent, two level strategic environmental assessment process, broadly scoped to address sustainability issues, applied to over 400 national level sectoral policies/programs and over 210 district development plans:</p> <ul style="list-style-type: none"> <li>• driven by concerns about inadequate attention to environmental factors</li> <li>• initiated during completion of planning process</li> <li>• focus on links between poverty and the environment (key considerations: livelihoods, health, vulnerability)</li> <li>• broad conception of “environment” (biophysical, social, cultural, micro-economic and institutional)</li> <li>• national level basic process elements: understanding context, determining objectives and targets, defining baseline conditions, evaluating the existing policy/program/plan, developing indicators, considering alternatives, considering scope for mitigation, monitoring and evaluation</li> <li>• additional considerations: links between problem recognition and pursuit of suitable responses, (in)consistency and (in)compatibility between policies</li> <li>• criteria grouped under livelihoods, vulnerability, institutional context, social and cultural and local economic conditions</li> <li>• district level application of sustainability appraisals with standard contents: overview of appraisal, baseline conditions, summary of relevant policies/programs/plans, key areas of concern for poverty reduction, performance of individual policies/programs/plans (judged in light of a “sustainability test”), measures taken to improve performance, measures for improving future policies, programs and plans</li> <li>• work largely done by government officials, with some broader participation in later stages (constrained by short time scale)</li> <li>• implementation accompanied by institutional capacity building for strategic level sustainability assessment at national and district levels</li> <li>• aims: appropriate modification of initial programs/plans; better integration of national policy and district level practical delivery; and establishment of a base for earlier and more direct integration of broadly environmental factors in next rounds of program/plan development/revision</li> </ul>
<p>Forest Stewardship Council certification principles, criteria, standards and process for forestry operations and</p>	<p>A global set of ten principles, elaborated in 56 criteria, for application by third-party certifiers accredited by the FSC:</p> <ul style="list-style-type: none"> <li>• principles and criteria apply generally to tropical, temperate and boreal forests, and to replanted and plantation forests</li> <li>• more detailed standards for particular jurisdictions and forest-types prepared at the national or local level; supplement the generic objectives and criteria with local indicators and verifiers, and additional criteria</li> <li>• principles and criteria set by FSC membership divided into three “chambers” – environmental, social and economic – including</li> </ul>

<p>wood products (FSC, 2004b)</p>	<p>representatives from environmental and social organizations, forestry and timber bodies and corporations, community forestry groups, indigenous people's organizations and forest product certification bodies</p> <ul style="list-style-type: none"> <li>• FSC-accredited national and sub-national standards set by similarly representative multi-stakeholder bodies with a consultative process</li> <li>• individual certifications are transparent, subject to peer review and follow-up audits</li> <li>• supply train verification for wood products</li> <li>• standard setting, certification and labelling accompanied by educational efforts focused on “improving forest management, incorporating the full cost of management and production into the price of forest products, promoting the highest and best use of forest resources, reducing damage and waste, and avoiding over-consumption and over-harvesting”</li> </ul>
<p>Regional Municipality of Waterloo terms of reference for assessment of a rapid transit initiative (RMW, 2005)</p>	<p>A set of six goals expanded to 15 criteria for assessing alternatives</p> <ul style="list-style-type: none"> <li>• enhance our environment</li> </ul> <p>relative amount of land consumed  relative impact on air quality  relative impact of emissions generated that contribute to climate change</p> <ul style="list-style-type: none"> <li>• build vibrant urban places</li> </ul> <p>relative contribution to Region re-urbanization objectives  relative contribution to innovative urban design  relative contribution to public health</p> <ul style="list-style-type: none"> <li>• provide greater transportation choice</li> </ul> <p>relative contribution to increased transportation choice  relative contribution to increased Region transit ridership  relative affordability of personal transportation cost  relative flexibility to changes in operation</p> <ul style="list-style-type: none"> <li>• protect our countryside</li> </ul> <p>relative contribution to the Region’s countryside protection goal</p> <ul style="list-style-type: none"> <li>• foster a strong economy</li> </ul> <p>relative contribution to downtown revitalization  relative capital cost to the Region</p> <ul style="list-style-type: none"> <li>• ensure overall coordination and cooperation</li> </ul> <p>degree of compatibility with other Regional plans and strategies  degree of compatibility with provincial and federal plans and strategies</p>

**Appendix 2 An elaboration of the generic assessment criteria for applications such as the Mackenzie Gas Project case**

The generic assessment criteria discussed in the main text above are derived from the basic requirements for progress for sustainability. These requirements and criteria can be applied to any project, anywhere. But for practical purposes they need to be elaborated to take into account the main particulars of the case and its context. One option is to take the generic list of basic sustainability issues and add details and specifics that recognize the case and context. A rough structure for that is presented below. Often it will be better to design the assessment framework in the other direction – to begin with the established case and context issues and expand these as necessary to include all the generic sustainability considerations. That is the approach taken in Appendix 3.

In this appendix, the objective is simply to clarify the nature of the issues that are covered by the generic sustainability criteria, and that should be addressed in all sustainability assessments of major undertakings such as the proposed Mackenzie Gas Project. The list below takes the generic sustainability assessment criteria and provides basic elaborations in the form of key considerations under each main criterion category, plus the trade-off rules and other integration and overall evaluation factors. The elaborations take into account the general character of the proposed Mackenzie Gas Project and its context. Space is left in each category for adding case and context specific issues. But considerably more detail would be required if we were to adjust and expand the list of considerations to address directly all of the key issues that arise from the case and its context.

The intent here is merely to illustrate the major sustainability assessment considerations that would have to be faced in such a case. The result is a framework in which more specific factors and emphases could be incorporated, preferably through an open public process since the identification, specification and priority ordering of important issues is as much a matter of preference and judgement as it is an application of technical understanding.

The issues presented below are relevant to the evaluation of project purposes and underlying needs, comparative assessment of the reasonable alternatives and design details, determination of acceptability and conditions of approval, and judgements related to implementation, monitoring, adjustment and decommissioning. It is also meant to cover not just the full range of sustainability requirements but also all possibly affected socio-economic and ecological systems from the local to the global. Each item should be considered with regard to the roles and interests of multiple actors within those systems and the broader set of sustainability interests, including those not easily represented (e.g., interests of future generations). Effects to be considered under each of the criteria include those that are direct and indirect, cumulative as well as individual, and long term as well as more immediate.

**Basic sustainability criteria and major generic considerations**

<b>1. Social-ecological system integrity</b>	
a.	Effects on the capacity of local ecosystems to deliver valued ecosystem services reliably into the future (including basic effects on nutrient cycling, primary production, water cycling, wildlife habitat, etc., and local/regional effects on climate and flood regulation, fresh water,

<p>country foods, etc.)<sup>10</sup></p> <ul style="list-style-type: none"> <li>b. Effects on the resilience of local socio-ecosystems (including effects on economic and biological diversity and other factors influencing ability to recover from serious disruptions, with special attention to effects where current pressures are significant)</li> <li>c. Effects on the capacity of regional and global ecosystems and socio-ecosystems to deliver valued services reliably into the future (including effects on greenhouse gas emissions, regional economic and biological biodiversity, pollutants with transboundary range, and other areas of current significant stress)</li> <li>d. Effects on population, overall consumption and consumption of commodities or services posing particular risks (including energy and other natural resources demand, local and broader implications and full product/service life cycle)</li> <li>e. Effects on longer term availability of non-renewable and renewable resources</li> <li>f. Effects on people particularly vulnerable to social/economic/health stresses related to environmental degradation</li> <li>g. Effects on local identity, diversity and mutual capacity (including effects on traditional knowledge and cultural practices, local diets, local autonomy, self-reliance in food security)</li> <li>h. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>2. Sufficiency and opportunity</b></p> <ul style="list-style-type: none"> <li>a. Effects on the fulfillment of basic human needs (access to nutritional food, shelter, etc.)</li> <li>b. Effects on human health (including nutritional requirements, exposure to toxic substances, sanitation, disease vectors, etc.)</li> <li>c. Effects on local livelihood opportunities (including volume, accessibility, diversity, expressive quality, self-directedness, durability)</li> <li>d. Effects on access to resources (including natural, technological and knowledge resources, adequacy of resource base, and reliability and durability of access)</li> <li>e. Effects on livelihood security (including effects on local self-reliance, community solidarity, land and other rights and entitlements, participation in decision making, access to legal redress, vulnerability to violence).</li> <li>f. Effects on access to markets (including local to international levels, price and market stability, tax and other influences, and relationships with established or potential new trading partners).</li> <li>g. Effects on delivery of needed social, health, educational and other programmes (including effects on local to national revenues, administrative capacity, likely allocation to meet needs)</li> <li>h. Effects on and implications of further investment (including effects on the nature and distribution of opportunities, consumption, expectations, and associated social and infrastructural costs)</li> <li>i. Effects on education and training (including the availability of local, regional and national opportunities).</li> <li>j. Effects on reproductive health</li> <li>k. Effects on acceptance of sufficiency among the already comfortable</li> <li>l. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>3. Intragenerational equity</b></p> <ul style="list-style-type: none"> <li>a. Effects on the wealth and resource access gaps between the first and fifth quintile of the local/territorial/national population</li> <li>b. Effects on the gap in practical ability to exert influence in governance (related to the</li> </ul>

<sup>10</sup> See Millennium Ecosystem Assessment Board (2005), p.4

<p>undertaking, and in general) between the first and fifth quintile of the local/national population</p> <ul style="list-style-type: none"> <li>c. Effects on equality of access to health, valued employment, respected knowledge and community security</li> <li>d. Effects on distribution of wealth, influence and access to resources between dominant groups and indigenous peoples and minority groups</li> <li>e. Effects on distribution of wealth, influence and access to resources between men and women (including effects on traditional roles, education, influence in governance, personal and financial security, control of family resources, reproductive choice, and access to livelihood opportunities)</li> <li>f. Effects on distribution of wealth, influence and access to resources between advantaged and disadvantaged regions within territory/nation and between advantaged and disadvantaged nations (including effects on revenue flows, dependency effects, etc.)</li> <li>g. Effects on material and energy intensity of consumer and other satisfactions for the wealthy</li> <li>h. Effects on the well-being of non-human species (including effects on habitat, quality of ecosystem services, vulnerability to stresses)</li> <li>i. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>4. Intergenerational equity</b></p> <ul style="list-style-type: none"> <li>a. Displacement of costs to and/or creation of benefits for future generations (including social, cultural, economic, political, and ecological)</li> <li>b. Long-term effects on delivery of ecosystem services (including direct, indirect and cumulative effects on system resilience and proliferation or strengthening of stresses)</li> <li>c. Long-term effects on the resilience of socio-ecological systems (including effects on economic diversity, flexibility, spare resources and other fall back options, vulnerability to outside pressures)</li> <li>d. Effects on capacity of future generations to deal with risks and stresses (including effects on community solidarity and partnerships, system knowledge, administrative skills, monitoring and adaptation mechanisms)</li> <li>e. Long-term substitution effects (especially where the initiative involves some compromise of ecological integrity in the pursuit of economic gains)</li> <li>f. Introduction or reduction of long term risks of potentially significant effects (local, territorial/national/global)</li> <li>g. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>5. Resource maintenance and efficiency</b></p> <ul style="list-style-type: none"> <li>a. Effects on extent and severity of damage from resource extraction (over full life cycle of the initiative, including induced and cumulative effects, as compared to existing practices and to alternatives)</li> <li>b. Effects on net use of energy (over full life-cycle, as compared to existing practices and to alternatives), energy quality matching, and the nature of energy sources (including any encouragement of, or bridging to, renewable and low impact sources)</li> <li>c. Effects on net use of water (over full life-cycle, as compared to existing practices and to alternatives, including effects on availability of water for ecosystem functions as well as human needs)</li> <li>d. Effects on net use of other materials and resources (including habitat and traditional use areas, forests, fisheries, tourism potential, wetlands, marginal lands and endangered ecosystems)</li> <li>e. Effects on transition from non-renewable and high impact energy and material sources to</li> </ul>

<p>renewable and low impact sources</p> <ul style="list-style-type: none"> <li>f. Effects on volumes and potential hazardousness of direct and embodied pollution and other wastes (throughout the life-cycle of the initiatives and the products involved, as compared to existing practices and to alternatives)</li> <li>g. Effects on administrative and infrastructure requirements to ensure proper management</li> <li>h. Rebound effects of savings from efficiencies facilitating expansion of demands and effects elsewhere</li> <li>i. Simplification effects of efficiencies eliminating desirable diversity, local suitability and redundancy</li> <li>j. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>6. Socio-ecological civility and democratic governance</b></p> <ul style="list-style-type: none"> <li>a. Effects the on social awareness of citizens (including through involvement in framing problems and solutions, opportunities to create or strengthen social ties, awareness of minority groups, etc.)</li> <li>b. Effects on ecological awareness of citizens (including citizen awareness of ecosystem functions and capacities and associated value, and preservation of related traditional knowledge)</li> <li>c. Effects on local governmental and regulatory capacity (including the expertise, resources and commitment to deal with anticipated demands and unexpected challenges, transparency, accountability)</li> <li>d. Effects on local non-governmental capacity (including the confidence, skills and public interest commitment of grassroots groups and other civil society organizations)</li> <li>e. Effects on participative practices and democratic community values (including effects of the planning as well as implementation of the initiative)</li> <li>f. Effects on adequacy of, and enforcement/compliance with, legal requirements (including fair access to due process, and application of national law as well as international treaties and multilateral environmental agreements).</li> <li>g. Effects on social responsibility as well as innovative drive of market participants</li> <li>h. Effects on building and transferring understanding and capacities (including maintenance and use of traditional knowledge and expansion of educational attainment)</li> <li>i. Effects on tolerance, mutual respect, non-violence (as supported in law, enabled by fair opportunity, and complemented by education)</li> <li>j. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</li> </ul>
<p><b>7. Precaution and adaptation</b></p> <ul style="list-style-type: none"> <li>a. Risks of significant damages (including known but unlikely perils and low or ill-understood risks of potentially significant problems) as compared to existing practices and to alternatives</li> <li>b. Precautionary and adaptive qualities of the administrative context and implementation plans, especially the ability to identify and deal with risks (including adequacy of information on new products and processes, and adequacy of monitoring and response provisions and capabilities)</li> <li>c. Adaptive qualities of the design of the initiative (including incorporation of qualities facilitating adaptation in the face of surprise: flexibility, reversibility, diversity, fallback options, safe-fail characteristics)</li> <li>d. Certainty of impact predictions as compared to anticipation of effects from existing activities and alternatives</li> <li>e. Certainty of effects of enhancement and mitigation measures (including the tested reliability</li> </ul>

<p>of proposed practices)</p> <p>f. Effects on security (including physical, economic and ecological security)</p> <p>g. Effects on building a context and culture of precaution and adaptation.</p> <p>h. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</p>
<p><b>8. Immediate and long term integration</b></p> <p>a. Interrelations among anticipated effects of the initiative (including positive feedbacks and conflicts)</p> <p>b. Combined and/or synergistic effects with other current and reasonably anticipated local or national activities and undertakings</p> <p>c. Effects on long term trends, risks and opportunities (local to global)</p> <p>d. Effects on relationships among the key stakeholders</p> <p>e. Effects on national/territorial/sectoral/community sustainability strategies and other identified priorities and objectives</p> <p>f. Likelihood of mutually reinforcing positive effects</p> <p>g. Risk of conflicting effects and/or mutually reinforcing negative effects</p> <p>h. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</p>
<p><b>9. Trade-offs</b></p> <p>a. Avoidance of significant adverse effects unless alternative is acceptance of more adverse effects (including avoidance of decline in major area of existing concern, or reduction of prospects for resolving priority problems)</p> <p>b. Avoidance of trade-offs where stronger mitigation efforts are feasible</p> <p>c. Avoidance of displacement of significant adverse effects from the present to the future unless alternative is displacement of more adverse effects</p> <p>d. Use of open participative process for discussion and justification of proposed trade-offs</p> <p>e. [additional consideration(s) based on specifics of case and/or local circumstances and priorities]</p>
<p><b>10. Additional case- and context-specific criteria</b></p> <p>[additional consideration(s) based on consideration of the case/context]</p>
<p><b>Overall assessment conclusions</b></p> <p>Consideration of whether in individual and overlapping areas there will be</p> <p>I. fully beneficial results (there are firm grounds for expecting improved outcomes, and no significant damages or risks in any aspect are anticipated);</p> <p>II. net benefits but with some negative effects and risks that should be mitigable through tested methods;</p> <p>III. no assurance of net benefits (significant damages or risks are likely or possible, and adequate enhancement of positive effects and/or mitigation of adverse effects may depend on more information or firmly imposed conditions); or</p> <p>IV. likely net losses, including significant negative effects or risks that are not adequately mitigable using tested methods.</p> <p>Overall judgement about the likelihood of net positive sustainability effects with multiple benefits, with no significant long term damages or risks, and acceptable trade-offs, in comparison with other options</p>

### ***Appendix 3 A consolidated list of sustainability issues in an illustrative evaluation matrix framework for Mackenzie Gas Project sustainability assessment***

For the purposes of illustration, here below is a broad sustainability assessment framework designed specifically for the Mackenzie Gas Project. The framework uses a simple evaluation matrix to present major issues for consideration in a sustainability based assessment.<sup>11</sup> The issues are organized into

- a set of sustainability effects issues, organized as questions in nine groupings or categories,
- two additional sections addressing trade-offs and alternatives, and
- a final net results and summary section.

The set of issue categories and questions covers concerns within and beyond the project area; it consolidates the two lists (issues in the project area and issues beyond the project area) provided in the main text above. Unlike the issues list in Appendix 2, which is organized around generic sustainability requirements, this one begins with the evident case and context-specific sustainability issues – the ones that surround the particular project and in the larger background of development history, needs and expectations in which the project has been proposed. The questions are meant to cover the full range of sustainability requirements with implications for possibly affected socio-economic and ecological systems from the local to the global. However, the focus is on case and context-specific concerns.

The trade-off issue categories are taken from the generic set of trade-off concerns for sustainability assessment discussed in the main text above. They would need to be expanded and specified for the Mackenzie Gas Project case, when the main trade-off issues have become apparent.

All of the sustainability questions are presented in a simple evaluation matrix. The matrix is designed for application to each of the reasonable alternatives under consideration. Each item in the matrix should be considered with regard to the roles and interests of multiple actors within those systems and the broader set of sustainability interests, including those not easily represented (e.g., interests of future generations). Effects to be considered under each of the criteria include direct and indirect, cumulative as well as individual, and long term as well as more immediate.

In the matrix, the columns numbered I-IV represent a continuum of anticipated gains and losses. The four identified points along the continuum are as follows:

- I. Fully beneficial. There are firm grounds for expecting improved outcomes. No significant damages or risks in any aspect are anticipated.
- II. Net benefits expected but with some negative effects and risks. The latter should be mitigable through tested methods.
- III. Net benefits not assured. Significant damages or risks are likely or possible. Adequate enhancement of positive effects and/or mitigation of adverse effects may depend on more information or firmly imposed conditions.
- IV. Net losses expected, including significant negative effects or risks that are not adequately mitigable using tested methods.

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<sup>11</sup> This matrix structure draws from a design developed by Erin Rogozinski.

These very basic evaluation options are clearly insufficient. Some of the issue questions cannot be answered directly by picking one of the four expected benefit or loss positions. And for most of the questions, useful answers will need to go well beyond a simple check-off. The four options nonetheless provide a helpful reminder the essential task of sustainability assessment in seeking multiple (and mutually reinforcing) net benefits while avoiding, significant risks and losses.

No quantification is assumed. Nor is there a presumption that each consideration is as significant as the next. A final column is provided for comments on significance, uncertainties, enhancement and/or mitigation possibilities and other implications. The matrix does not therefore provide an easy way to compare alternatives.

It is possible that the basic approach here could be refined to allow some rough quantification through application of participative processes for weighting as well as identifying the key specific as well as generic considerations. No doubt this would be accompanied by debates about whether the numerical results would be more illuminating than misleading.

Public discussion is needed in any event. All sustainability assessments involve choices about what issues and options are most worthy of attention and how they should be weighed. Ideally, in a fully implemented sustainability assessment process, the generic and specific criteria would have been identified and used from the outset in the consideration of needs and opportunities to pursue, and the purposes and options to evaluate. To the extent possible and realistic in the circumstances, this process would also have included engagement of potentially relevant stakeholders, including anticipated beneficiaries, in the efforts to identify case-specific conditions, concerns and priorities, to consider them in light of the sustainability requirements that apply everywhere, to incorporate the results in the listing of key issues in an evaluation matrix (or other structure), and to decide on appropriate means of assessing and comparing effects and options. For the Mackenzie Gas Project assessment, discussion of such matters can occur (and no doubt will occur at least implicitly) in the hearings.

At best, then, this matrix provides a framework in which more specific factors (e.g., project-related valued ecosystem components) and emphases can be incorporated, or to which they can be added. It is just a starting point for further adjustment and elaboration in the course of the formal review and approval deliberations.

**A sustainability assessment matrix for the Mackenzie Gas Project case**

Major categories of sustainability issues and associated questions for the Mackenzie Gas Project assessment review	I	II*	III*	IV	* Comments on the significance of factors, uncertainties, requirements to enhance or mitigate effects, tradeoff implications, etc.
<i>1. Biophysical, ecological and socio-ecological systems and traditional activities</i>					
1.1 Might the effects of construction and operation of the proposed pipeline, related infrastructure and associated and induced projects, undermine the resilience of ecosystems, the health, abundance and distribution of wildlife populations and their habitats,					

and the continuation of traditional activities of the people and communities in the project area?					
1.2 How completely will the residual components, equipment and wastes of the project be removed, and how fully will negative effects be corrected by site rehabilitation or other initiatives, when the project ends?					
1.3 How might the project affect present and future land use planning and conservation initiatives and land and wildlife management plans?					
1.4 Beyond the associated and induced activities, what otherwise likely additional hydrocarbon exploration, extraction and transportation undertakings and other activities in the region might combine with the effects of the project on ecosystems and traditional activities?					
1.5 Are the ecological systems, conservation, and traditional use areas surrounding the communities in the project area and larger region likely to be generally in better or worse shape after the project is over?					
1.6 Might activities related to or induced by the project contribute to lasting effects on the seasonal habitats and/or movements of migratory species and the ecological relations and human activities dependent on them?					
1.7 How may the project and associated and induced undertakings contribute to or detract from Canadian efforts to meet its commitments to reduce greenhouse gas emissions?					
1.8 How may continuing climate change affect the project and related activities and their effects on the ecology and communities of the project area?					
1.9 How might these prospects be different without the project or if some alternative were pursued instead of the project as proposed?					
[Optional: additional biophysical and socio-ecological systems consideration(s)]					
<b>Summary: Biophysical and socio-ecological systems</b>					
<b>2. Livelihoods and socio-economic well-being</b>					
2.1 What might be the overall effects on the maintenance and enhancement of livelihood foundations (e.g., available resources, applicable skills, education, knowledge of the land) and opportunities, including long term livelihood diversity and security in the communities of the project area and the larger region?					
2.2 What might be the positive and negative effects					

on community well-being and the social determinants of health – including livelihood security, diversity of opportunities, self-reliance, physical health, community solidarity and commitment, intergenerational relations, the distribution of employment and influence, cultural preservation and evolution, and social status – during pipeline construction, during operation and after decommissioning (taking into account the effects of associated and induced projects and activities as well as those of the project itself)?					
2.3 What might be the effects of the project on household and family solidarity, inter-household relationships, community cohesion, and inter-community relationships?					
2.4 What might be the effects of the project on currently negative social, economic and cultural trends (e.g., concerning health and social problems) and on means of reversing these trends?					
2.5 What might be the effects of the project on the continuation of traditional ways, cultural norms and supports, and social relationships (e.g., respect for Elders)?					
2.6 What might be the effects of the project on community and regional public infrastructure and programs (e.g., affordable and accessible good quality housing, social programs and services)?					
2.7 Are the project and the gas it will transport needed more now (taking into account the probable effect of the project on other hydrocarbon activities in the Northwest Territories and the expected use of the extracted and transported gas) than they might be in the future?					
2.8 How are the project and associated and induced activities likely to affect and be affected by the anticipated demand for skilled employees in the hydrocarbon and pipeline construction sector in the project area, in the larger region and in Canada?					
2.9 Is proceeding with the project now likely to leave the communities of the project area, the region and Canada more able or less able to deal with new possibilities and stresses in the future?					
2.10 How might these prospects be different without the project or if some alternative were pursued instead of the project as proposed?					
[Optional: additional livelihoods consideration(s)]					
<b>Summary: Livelihoods</b>					
<b>3. Equity</b>					
3.1 Is the project (along with associated and induced					

activities) likely to increase or decrease the equity of distribution of benefits and risks (e.g., employment opportunities, revenue flows and access to resources, service responsibilities, opportunities for participation in crucial decision making, and capacity to deal with emerging problems) in the communities of the project area, in the region and in Canada?					
3.2 Is this distribution likely to be more equitable or less equitable during project operation than it is now?					
3.3 Is this distribution likely to be more equitable or less equitable after the end of the project than it is now?					
3.4 Is the end of the project (and associated activities including revenue flows) likely to leave future generations in the communities of the project area, in the larger region and in Canada with better prospects or worse prospects than they would have had without the project?					
3.5 How might these prospects be different if some alternative were pursued instead of the project as proposed?					
[Optional: additional equity consideration(s)]					
<b>Summary: Equity</b>					
<b>4. Resource access, use and efficiency</b>					
4.1 What may be the local, regional and national effects on long term access to natural gas and other hydrocarbon resources?					
4.2 How effectively will requirements for energy and other resources and materials (water, gravel, lumber, pipe, equipment, etc.) be minimized, and how will the benefits of energy, resources and materials uses be maximized during construction, operation and decommissioning of the project?					
4.3 When the project is over, is energy and materials access and use in the communities in the project area and larger region likely to be more sustainable or less sustainable?					
4.4 Is the project (including consideration of the importance of the anticipated uses to which the extracted and piped resources may be put) likely to contribute positively or negatively to the longer term efficiency of energy and materials use in the project area, the larger region, in Canada and beyond?					
4.5 Could efficiencies in the product lifecycle – from initial extraction to end use – serve to increase the viable life of the project?					
4.6 Do the overall effects of the project promise any					

significant demonstration of or pressure for more efficient allocation and/or use of energy and other resources in the project area, in the region, in Canada and beyond?					
4.7 Might some alternative options, including not proceeding with the project now, or proceeding at a different rate or scale, do better?					
[Optional: additional resource access, use and efficiency consideration(s)]					
<b>Summary: Resource access, use and efficiency</b>					
<b>5. Boom and bust</b>					
5.1 What may be the boom-bust effects during and after construction and during and after pipeline operation (taking into account associated and induced projects and activities as well as the pipeline project itself)?					
5.2 What particular effects may result from the nature of and rises in revenue flows with the commencement of the project and the uses made of these revenues?					
5.3 What particular effects may result from the decline in revenue flows with the end of the project, with special consideration of the activities that had been funded by these revenues?					
5.4 What are the best estimates of induced and otherwise likely additional hydrocarbon exploration, extraction and transportation activities in the region, during and past the expected lifetime of the project and how might these affect the boom-bust effects of the project?					
5.5 What practical means are available to extend the life of the project or more generally to extend the life of hydrocarbon extraction, transportation and related activities in the project area?					
5.6 What are the local and regional risks of dependence on a temporary hydrocarbon-based economy?					
5.7 How might these risks be minimized?					
5.8 What are the possibilities that the project will trigger major consequential changes in the project area and what are the implications for these changes once the project is over?					
5.9 Might any boom-bust effects during and after construction and during and after pipeline operation (taking into account associated and induced projects and activities as well as the pipeline project itself) have significant positive or negative effects beyond the project area and adjacent region?					
5.10 Might the project, including the expected use					

of the delivered gas, exacerbate boom and eventual bust phenomena beyond the project area?					
5.11 Might the end of the project leave deficiencies and problems that would have to be assumed by Canada and other authorities beyond the project area?					
5.12 Might some alternative options, including not proceeding with the project now, have more beneficial or less risky effects in the project area and larger region?					
[Optional: additional boom and bust consideration(s)]					
<b>Summary: Boom and bust</b>					
<b>6. Bridging</b>					
6.1 Given the temporary economic intensity of the pipeline construction, the longer but still limited period of hydrocarbon extraction and transportation, and the similarly limited period of associated revenue flows, what bridging efforts are planned by the proponent, the communities of the project area, authorities in the larger region, the Canadian government to ensure that the immediate and medium term project benefits and opportunities will be used to secure lasting gains for the project area and larger region?					
6.2 Are there firm grounds for confidence that these initiatives will be successful?					
6.3 What longer term possibilities for sustainable livelihoods are anticipated and what programs and other initiatives are planned by the proponents and by the relevant government bodies to establish firm bridges to such livelihoods (in addition to dealing with existing concerns and with concerns anticipated during the life of the project)?					
6.4 Could bridging efforts in this case be developed as a model for similar efforts in other cases of temporary economic undertakings?					
6.5 How might the anticipated or potential programs and other initiatives be affected by different assumptions about the size, direction and timing of revenue flows?					
6.6 How might these prospects be different if some alternative were pursued instead of the project as proposed?					
[Optional: additional bridging consideration(s)]					
<b>Summary: Bridging</b>					
<b>7. Capacity building</b>					
7.1 To what extent will project-related decision					

making and other opportunities create or strengthen social, cultural and ecological awareness, and build community capacity for effective participation in weighing options and making choices relevant to future livelihoods and wellbeing?					
7.2 To what extent will the project and related activities and their effects encourage or discourage maintenance, renewal and intergenerational transfer of traditional knowledge?					
7.3 To what extent will the project help or hinder the building of individual, community and institutional capacity (commitments, skills, understanding, cooperative arrangements, and other tools and resources) and local and regional controls for dealing with project-related and other challenges in and beyond the project area?					
7.4 To what extent will the project (plus the associated, induced and other concurrent projects and activities) impose realistic or unrealistic expectations or requirements for the community, territorial, provincial, national and other governance and service institutions to deal capably with existing and anticipated problems, needs and aspirations in project area and larger region during project construction and operation?					
7.5 To what extent will further capacities be expected or required to deal with the transitions from project construction to operation and operation to post-project life?					
7.6 How adequate are the current plans of government agencies and other service providers at the community, territorial/provincial and national levels, to deal with likely and possible project-related needs, considering also other current and anticipated demands for the relevant services?					
7.7 What would be different if some alternative were pursued instead of the project as proposed?					
[Optional: additional capacity consideration(s)]					
<b>Summary: Capacity</b>					
<b>8. Preparedness in the face of uncertainties</b>					
8.1 How have the project and its implementation plans been designed to be able to cope with and adjust in the face of unanticipated problems (e.g., through design and timing flexibility, back-up plans, diversity of options, emergency response capacity)?					
8.2 What is the level of consensus, confidence and certainty associated with future probable and possible development scenarios and related effects in the project area?					

8.3 What does the project (plus the associated and induced projects and activities) expect or require of the preparedness of community, territorial, provincial, national and other governance and service institutions to ensure anticipatory design, and ongoing monitoring and adaptation during delivery, of socio-economic and ecological programs and other services to deal with the surprises that are likely given the uncertainties about possible effects during and after the end of the project?					
8.4 How would the project (in construction, operation and after decommissioning) affect community, regional and national preparedness for dealing with new situations, pressures and opportunities?					
8.5 How would such preparedness be different without the project or if some alternative were pursued instead of the project as proposed?					
[Optional: additional preparedness considerations(s)]					
<b>Summary: Preparedness</b>					
<b>9. Interactions among effects</b>					
9.1 How might the anticipated positive effects in various areas and at different scales be mutually reinforcing and how might these mutually reinforcing effects be strengthened?					
9.2 How might the anticipated negative effects (including risks) be mutually reinforcing and how might these reinforcing effects be mitigated or eliminated?					
[Optional: additional interaction consideration(s)]					
<b>Summary: Interactions among effects</b>					
<b>10. Trade-offs</b>					
10.1 Are there likely to be significant adverse effects (e.g., decline in major area of existing concern, or reduction of prospects for resolving priority problems) that cannot be avoided without accepting more adverse effects elsewhere?					
10.2 Are any trade-offs proposed where stronger mitigation efforts would be feasible?					
10.3 Would any proposed trade-off displace significant adverse effects from the present to the future (and would this trade-off be unavoidable without displacing more serious adverse effects to the future)?					
10.4 Have the proposed trade-offs been discussed in and accepted through an open participative process?					
[Optional: additional Trade-off consideration(s)]					
<b>Summary: Trade-offs</b>					

<b>11. Alternatives</b>						
11.1 What are the overall long term advantages and disadvantages for the project area, larger region and nation of proceeding now with the currently proposed project scale, pace and components, versus delaying the project, or proceeding with other possible timing, scale, pace and/or components?						
<b>Summary: Alternatives</b>						
<b>NET RESULTS</b>						
1. Biophysical and social-ecological systems						
2. Livelihoods						
3. Equity						
4. Resource access, use and efficiency						
5. Boom and bust						
6. Bridging						
7. Capacity						
8. Preparedness for uncertainties						
9. Interactions among effects						
10. Trade-offs						
11. Alternatives						
<b>SUMMARY</b> Likelihood of net positive sustainability effects with multiple benefits, with no significant long term damages or risks, and acceptable trade-offs, in comparison with other options						
<b>NOTES regarding priorities, uncertainties, tradeoffs, approval conditions and other implications</b>						