

Application of a contribution to sustainability test by the Joint Review Panel for the Canadian Mackenzie Gas Project

Robert B Gibson

Ultimately, the enhancement we need to deliver through environmental assessment is confidence that every approved undertaking will move us positively towards a desirable and durable future. In Canada, the most promising steps in this direction have been in several major project assessment reviews with public hearings and independent panels that applied a contribution to sustainability test. The most recent and advanced case is the review of a proposed C\$16.2 billion natural gas infrastructure undertaking in the Northwest Territories. The Panel's application of the contribution to sustainability test compared the cumulative effects, equity and legacy implications of a range of project pace and scale alternatives. The Panel concluded that the project would offer positive overall contributions only if 176 recommendations were implemented. While the Panel's process was slow and the governments accepted only the most modest recommendations, the Panel's review set a new standard of analytical practice. This paper examines how the review was done and assesses its strengths and limitations, with particular attention to the design and application of the contribution to sustainability test.

Keywords: enhancement, sustainability assessment, Mackenzie gas pipeline, Canada, panel review, alternatives, trade-offs, net gains, cumulative effects, legacy

MOST ENVIRONMENTAL ASSESSMENT law and practice focuses on mitigation of significant adverse environmental effects. This is not entirely a bad thing. Certainly there are plenty of adverse environmental effects to mitigate. But as a general agenda, mitigation serves only to make our decisions and activities less damaging when what we should be doing is delivering positive contributions to the ecological and socio-economic foundations of lasting well-being.

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The Canadian Environmental Assessment Act, for example, centres its decision making on whether or not 'significant adverse environmental effects' will result from approval of a proposed project, and encourages mitigation of any such effects. The Act (Canada, 2011, s.2(1)) defines 'mitigation' as 'in respect of a project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means'.

The fundamental context for a more positive focus is the evident need to reverse global trends towards deeper unsustainability. While for many people key indicators of health and other economic well-being have been improving, environmental and inequity problems are rising (UNDP, 2010; IPCC, 2007; MEA, 2005). Our demands on the Earth's carrying capacity for humans have been increasing

steadily for decades and, according to some calculations, now exceed what can possibly be sustained in the long run.¹ At the same time, a large portion of the human population lacks a sufficient material basis for reliable nutrition, health and opportunity.² And most of the benefits of economic expansion have been going to those already enjoying material sufficiency, if not excess.³ These problems are deeply interconnected.

This very basic evidence of unsustainability indicates fundamental problems. Most obviously, the effects of conventional choices and associated institutions, decision-making structures and processes are pushing us in the wrong direction. But these choices, structures and processes are underpinned by goals and priorities that in turn rest on prevailing sets of underlying assumptions about the way the world works (e.g. focusing on parts instead of systems), about human well-being (e.g. focusing on material satisfactions instead of broader possibilities — creative, social, aesthetic, etc.), and about how people should view the environment (e.g. only as a source of commodities and services or also as a place for belonging, integration and stewardship). All of these merit reconsideration and innovative exploration at many scales.

The raw essentials for the necessary transition are, however, quite obvious. Every one of our decisions should aim to reverse the prevailing trends towards deeper unsustainability. In environmental assessments, every one of our new or renewed projects, programmes, plans and policies ought to be expected to make a positive contribution to a desirable and durable future.

Unfortunately, shifting environmental assessment law and practice from a focus on mitigating significant adverse effects to application of a contribution to sustainability test is easier said than done. The sustainability imperative is broad and long. It entails integrated attention to social, economic, ecological and other factors. It also goes well beyond mitigation to seek positive and lasting gains and to build a transition to more attractive and resilient futures. But moving in this direction is demonstrably possible. After decades of deliberation and experimentation, the intertwined core requirements for progress towards sustainability are reasonably clear, though they may be framed in countless different ways (Gibson *et al.* 2005). And if we combine recognition of these requirements with attention to the key considerations of case and context, we can without much difficulty specify the basic contribution to sustainability expectations for particular practical applications.

This paper recounts, and provides initial reflections on, the story of one recent major application of the contribution to sustainability test in an environmental assessment review: the Canadian case of the 2004–2009 Joint Review Panel assessment of the Mackenzie Gas Project. This proposed C\$16.2 billion undertaking centred on developing three gas

fields, associated gas gathering facilities and a 1,200 kilometre pipeline up the Mackenzie Valley in the Northwest Territories. The proposed undertaking was both a major industrial project and a strategic level initiative expected to induce further development activities and associated impacts with significant implications for regional futures.

The Mackenzie Panel's report (Mackenzie Panel, 2009) represents the most detailed effort so far by an environmental assessment hearing body in Canada to adopt and apply a contribution to sustainability test, identifying a suite of key issue areas covering the general requirements for progress towards sustainability, and building these explicitly into an analytical framework for evaluating a range of project alternatives, including the null option. A handful of other Canadian assessment panels had applied a contribution to sustainability test before (Voisey's Bay Panel, 1997; Kemess North Panel, 2007; Whites Point Panel, 2007). But only the Kemess North Panel had adopted an explicit analytical framework with sustainability-based criteria, and, in contrast to the Mackenzie Panel, the Kemess North Panel did not provide details on how use of this framework led to its conclusions and recommendations.

Where the Mackenzie Panel's work might stand in comparison with the wide range of sustainability assessment efforts in other countries is an open question that merits attention. Although it would not qualify as a powerful immediate influence on decision making, it may have few equals as a demonstration of how to go about a rigorous sustainability-based assessment review.

Inevitably, the case has some peculiarities. It is the product of a certain history, a particular environment, a unique alignment of jurisdictions and stakeholders. But, as will also be discussed, the case arises from and in a larger context of sustainability assessment applications, in environmental assessment and beyond. The basic approach and much of what was done in implementing it by the Mackenzie Panel are likely to be applicable, in more and less ambitious versions, almost anywhere.

The paper begins with an explanation of the spatial and historical context of the Mackenzie Gas Project. This is followed by a detailed discussion of the Mackenzie Gas Project Joint Review Panel's

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approach: how it applied the contribution to sustainability test in evaluating the project as proposed and in comparing project implementation possibilities. The paper ends with an account of the results of the Panel's sustainability-based analysis, its recommendations and their reception, and the larger lessons and implications of the case.

The context of the Mackenzie Gas Project

The Mackenzie Valley in Canada's Northwest Territories (see Figure 1) is storied land. One of the world's great subarctic rivers, the Mackenzie River flows northwest 1,700 kilometres from Great Slave Lake to the Beaufort Sea. For millennia the valley has been the home of Aboriginal peoples, Inuit on the northern coast and several First Nations peoples up the river valley, and Aboriginals still comprise roughly half the territory's population. Fur traders were the first outside economic interests to be attracted to the area. They began to arrive in the late eighteenth century and were followed by whalers off the Mackenzie Delta in the Beaufort Sea in the late nineteenth, and miners and oil industry entrepreneurs in the twentieth. The fur trade was a significant economic foundation into the second half of the twentieth century and wildlife harvesting remains a significant traditional activity today. Other economic initiatives have been typified by a succession of resource-centred booms and busts, and complicated by a colonial legacy with its share of regrettable ideas and behaviour (Rea, 1968; Dacks, 1981).

The area today is sparsely populated, with just over 40,000 people in the Northwest Territories as a whole, 18,000 in Yellowknife (the capital), and the rest mostly in about 30 relatively small communities. Incomes are reasonably high on average but inequitably distributed and more than offset by very high costs for non-local consumer products. The resource base is rich but far from markets. The ecological environment is largely unspoiled but includes persistent scars and worrisome declines in some populations, especially caribou. It is also highly

vulnerable to climate change. The cultural diversity is impressive and surprisingly resilient but beset by uncertainties about viable future livelihoods.

Some past and anticipated future employment possibilities centre on oil and gas exploration, extraction and transportation. The hydrocarbon industry has been in the Mackenzie Valley since the 1920s when oil was discovered at Norman Wells, a community midway up the Mackenzie River. After major hydrocarbon reserves were found on the north coast of Alaska, just to the west, in the late 1960s, exploratory drilling was expanded in the Mackenzie Delta and Beaufort Sea. By the early 1970s, enough gas had been confirmed to inspire a consortium of industry players to propose construction of a pipeline to move both Alaska and Mackenzie/Beaufort gas to southern markets.

The initial Mackenzie gas pipeline proposal was formally submitted in 1974. While it was welcomed by the Canadian federal government, it raised great concern among Aboriginal interests, who feared marginalization and loss of rights, traditional culture and livelihood opportunities in the industrial rush (Page, 1986). Under pressure from critics, the federal government appointed Mr Justice Thomas Berger of the British Columbia Supreme Court to carry out a formal public inquiry into the social-economic and cultural as well as biophysical aspects of the proposed project and to recommend appropriate terms and conditions for approval.

Berger's mid-1970s inquiry stands as a benchmark example of broadly defined environmental assessment, devoted to full and open engagement of the potentially affected people as well as specialized experts (Berger, 1977; Gamble, 1978). His final report, centred on a recommendation to delay project approval for ten years to allow for negotiation of land claims agreements with the Aboriginal groups, was and is still widely credited or blamed for stopping the project. But during the period of Berger's hearings the economic viability of the Mackenzie pipeline venture was undermined by confirmation of extensive and much less expensive gas close to existing distribution systems in Alberta (Robinson,

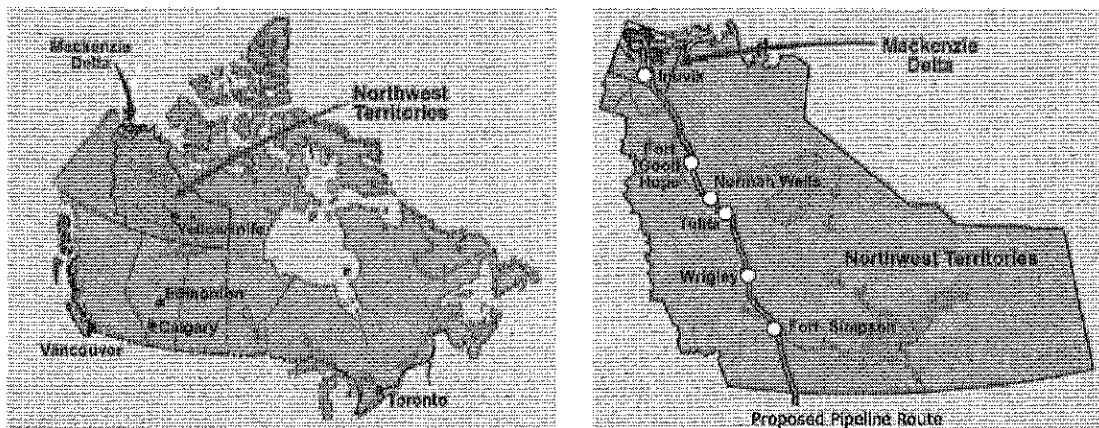


Figure 1. The Mackenzie Gas Project location in the Northwest Territories in Canada and proposed pipeline route
Source: <http://www.mackenziegasproject.com>

1983). The Mackenzie pipeline idea went into hibernation for nearly a quarter century.

The project emerged again in 2000, when a new hydrocarbon industry consortium, led by Imperial Oil,⁴ revived the Mackenzie pipeline megaproject. The C\$16.2 billion immediate undertakings involved development of three gas fields in the Mackenzie Delta, gathering systems to bring the gas to a central hub near Inuvik, and pipelines for natural gas and gas liquids, including a 1,200 kilometre gas pipeline up the Mackenzie Valley to northern Alberta (see Figure 1). The project as proposed would involve two to three years of construction and 20 to 50 years of operation. All of the key stakeholders recognized, however, that this would be only the tip of the development shovel. The project would open commercial access to a variety of northern gas fields. As the first means of getting northern gas reserves to market, it would induce a boom in exploration and extraction, bringing new opportunities but also testing capacities to resist ecological stresses, manage rapid change, and capture the benefits.

The key question was and is whether the cumulative legacy would be another addition to the long history of resource booms and busts in northern Canada or a pioneering use of non-renewable resources as a bridge to more sustainable livelihoods.

The contribution to sustainability approach used by the Mackenzie Panel

In 2004, the federal, territorial and Aboriginal governments established a Joint Review Panel to hold public hearings and assess the proposal. Included in the terms of reference was explicit instruction to respect the principle of contribution to sustainability for 'the existing and future social, cultural and economic well-being of residents and communities' (IGC *et al.*, 2004: 3–4 and appendix 2).

The Panel responded in its public hearings and report writing by taking three key steps: identifying the major project options, establishing an explicit sustainability-based framework for examining and comparing the project options, and carrying out the analysis, drawing conclusions and assembling recommendations. The major options identified by the Panel (Mackenzie Panel, 2009: especially chapters 3 and 19) were:

- No project;
- The project as proposed;
- or
- The project with a range of reasonably foreseeable expansions and further developments.

For its evaluation of these options, the Panel set out the major categories of long-term issues and built these issues into an analytical framework centred on five categories of key issues (Mackenzie Panel, 2009, especially chapters 5 and 19):

- Cumulative impacts on the biophysical environment;
- Cumulative impacts on the human environment;
- Equity impacts (fair distribution of benefits and risks);
- Legacy and bridging impacts; and
- Cumulative impacts management and preparedness (capacities for managing the risks and opportunities).

In addition, the Panel considered interactions among these concerns and resulting trade-offs.

This section outlines the Panel establishment and terms of reference and explains how the Panel built and used its assessment framework to evaluate the major options in light of effects in these five key categories.

Establishment of the Mackenzie Gas Project Joint Review Panel and its terms of reference

The Mackenzie Gas Project Joint Review Panel was established under an agreement that merged for this case three legislated environmental assessment process requirements: those under the Canadian Environmental Assessment Act, the Mackenzie Valley Resource Management Act and the Western Arctic (Inuvialuit) Claims Settlement Act – Inuvialuit Final Agreement (MVEIRB *et al.*, 2004). The project was and is additionally subject to a variety of regulatory requirements, also involving federal, territorial and Aboriginal authorities.

Details on the approach to be taken in the consolidated assessment were set out in special terms of reference (IGC *et al.*, 2004). Following the usual Canadian process, the Panel members, including four drawn from Mackenzie Valley communities and three others with relevant expertise, were appointed specially for the case rather than being members of a pre-established professional review agency (with the exception of one member drawn from the National Energy Board). Over the following five years (an exceptionally long review period that earned the Panel considerable criticism), the Panel established its procedures, carried out an initial review of the proponents' Environmental Impact Statement, requested further information and facilitated additional information requests by process participants, commissioned a set of background studies, determined the sufficiency of information for public hearings, held public hearings involving 558 presenters over 115 days in 26 communities, and prepared its report (Mackenzie Panel, 2009: 76–80).

The terms of reference established five basic principles for the assessment (IGC *et al.*, 2004: 3–4):

- Contribution to sustainability;
- Use and respect for traditional knowledge;
- Recognition of land claim agreements and treaties;
- Recognition of diversity; and
- The precautionary approach.

The five are interrelated and arguably each of them affects how assessment deliberations extend beyond mitigation to positive enhancement. The contribution to sustainability principle, however, is central. The core sustainability considerations, as set out in the Panel's terms of reference, can be seen in Box 1.

The Panel's assessment framework

The Panel, accordingly, adopted and elaborated a contribution to sustainability test as the basis for its evaluations and decisions. Summarizing its intentions prior to the beginning of its hearings (Mackenzie Panel, 2005: 3; Mackenzie Panel, 2009: 104), the Panel stated:

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.

In addition, the Panel recognized its own responsibility for developing and applying an analytical framework for evaluating the proposed project, in-

cluding its cumulative effects, options related to alternative development futures, and possible conditions of approval and other potential recommendations. To assist in this, the Panel commissioned a small set of independent reports, including one on approaches to creating sustainability-based criteria and frameworks and implications for the Mackenzie assessment review. The frameworks report focused on development of explicit criteria for major assessment judgements, for example about the significance of effects, the relative merits of competing project options, and the need for additional measures to ensure and enhance positive effects or to avoid and mitigate adverse effects (Gibson, 2006).

For criteria building, the frameworks report advocated recognition of all the general requirements for progress towards sustainability (Gibson *et al*, 2005), but emphasized specification of these requirements for the particular case and context. The specification would involve identifying the most important sustainability-related issues surrounding the undertaking being assessed — those arising in part from the nature of the projects and its reasonably anticipated potential effects, but also from the concerns and aspirations, stresses, assets, capacities, vulnerabilities, valued characteristics, positive and negative trends and other considerations of the place. The chosen set of evaluation and decision criteria would integrate the generic and context-specific considerations. The criteria might be numerous, especially given the size of the project and potentially affected area, but would be organized in a limited number of major categories. In addition, they would be expressed with heavy reliance on words and concepts broadly familiar to all of the participants in the hearings.

In the Mackenzie case, identification of the key contextual issues was remarkably easy. Hydrocarbon exploration activities and some relatively modest extraction and pipeline work had been experienced, sporadically, in the Norman Wells area since the 1920s and in the Mackenzie Delta and Beaufort Sea since the 1960s. Implications of a major Mackenzie gas pipeline project and resulting induced development had been debated since the 1970s, in the highly participative Berger Inquiry and thereafter (Berger, 1977; Page, 1986). By the time the Panel began its proceedings in 2005, the relevant authorities and communities shared a broad understanding not only of the proposed project but also of the history of deliberations on pipeline proposals and possible effects in the Mackenzie Valley area, in the broader context of hydrocarbon initiatives and northern development. While different perspectives on implications, priorities and preferences remained, the key issue areas were well recognized. The frameworks report suggested organizing the sustainability-based and issues-centred criteria as questions in 11 groupings: '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

Box 1. Terms of reference for Mackenzie Panel on the sustainability principle (IGC *et al*, 2004: 3–4)

Considering sustainable development in the EIR (Environmental Impact Review) process 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

A project's contribution to sustainability can be evaluated on the basis of the following:

- the extent to which a project makes a positive overall contribution towards environmental, social, cultural and economic sustainability
- how the planning and design of a project have considered how it affects achieving sustainable development
- how monitoring, management and reporting systems have incorporated indicators of sustainability
- the views of stakeholders and participants in the EIR process

building; preparedness in the face of uncertainties; interactions among effects; trade-offs; and alternatives' (Gibson, 2006: appendix 3).

The Panel adopted the recommended approach though it re-arranged the initial 11 groupings and further specified the case considerations, eventually settling on 36 key issues grouped under five headings (see Box 2) plus attention to interactive effects and trade-offs (Mackenzie Panel, 2009: chapters 5 and 19).

In its approach to all five issue categories, the Mackenzie Panel's basic assessment agenda was a long stride forward from the usual focus on mitigation of adverse project effects. Both positive and adverse effects were covered. Human and biophysical environment interactions were recognized. While direct, individual effects were addressed, the Panel concluded that cumulative effects were the main concern and saw that the cumulative results would depend not only on the nature of project activities but also on the capacities of authorities and communities to capture benefits and manage threats. Special attention was given to equity issues — the distribution of benefits, risks and damages within and across generations. The Panel understood that non-renewable resource exploitation represents a fleeting opportunity to build bridges to more durable future options (Mackenzie Panel, 2009: 479–480, 602–603). And although it aimed to favour options that would deliver multiple, mutually reinforcing gains in all areas of concern and potential, the Panel accepted that some trade-offs would be unavoidable and committed to evaluate them openly (Mackenzie Panel, 2009: 103–106, 612).

Comparison of alternatives by the Mackenzie Panel

The framework for evaluations and decisions was, however, only the first of two key elements of the Panel's approach to applying a contribution to sustainability test. The second was the identification of a set of alternatives for comparison. Environmental assessment practice in many jurisdictions is centred on judging the acceptability of a proposed undertaking. Implicit in the review is a set of absolute standards against which to test the proposal. Where the assessment focus is on mitigation, the standards are those used in determining whether an anticipated adverse effect will be 'significant'. One result is a substantial literature, and a large body of litigation, on what qualifies as significant. Another result is approved undertakings that may bring a multitude of insignificant adverse effects. In contrast, where assessment processes involve comparative evaluation of reasonable

Box 2. Mackenzie Panel's five categories of key issues

- Cumulative impacts on the biophysical environment
- Cumulative impacts on the human environment
- Equity impacts
- Legacy and bridging
- Cumulative impacts management and preparedness

alternatives, the effective choice can centre on which option is most desirable. We can seek what is best, rather than what is merely acceptable.

The Mackenzie assessment was centred on comparison of alternatives in a somewhat atypical way. The alternatives were not different ways of moving the gas to market but alternative development futures for the region related to different levels of pipeline project expansion. The Panel applied its criteria in an evaluation of 'the comparative prospects for net lasting gains from various proposed and possible pipeline throughputs and associated developments' (Mackenzie Panel, 2009: 106). Pipeline throughput was a proxy for the pace and scale of development. More gas throughput meant more compressor and heater stations and eventually a doubling of the pipeline itself. More throughput would also entail more gas supply and consequently more impacts from exploring and developing additional gas fields, building more connector pipelines and other infrastructure, and managing the associated increases in employees, revenues, ecological and social disruptions, other spin-off effects, and monitoring and enforcement needs (Mackenzie Panel, 2009: especially chapters 3 and 19).

As in all assessment cases, there was a null option — a future without the project. The other options involved points on a range of possibilities beginning with the immediate project as proposed by the proponents (the project as filed) and extending to an undefined potential maximum of expanded gas throughput. (Mackenzie Panel, 2009: 53–69, 588, 608–612). The Panel subdivided the range into four main possibilities for the purposes of its evaluation:

- The project as filed, centred on a gas pipeline drawing gas from three identified anchor fields capable of supplying 0.83 billion cubic feet of gas per day (Bcf/d), but with a throughput capacity of 1.2 Bcf/d.
- The project as filed with expansion of throughput in the range from 0.83 Bcf/d to the initial design capacity of 1.2 Bcf/d, involving development of one or more fields in addition to the three included in the project as filed.
- The project as filed with expansion of throughput (achieved by adding up to 11 more compressor stations and other facilities) in the range from 1.2 Bcf/d to 1.8 Bcf/d, the maximum expansion capacity anticipated in the design of the project as filed without increasing pipe size or doubling the pipeline.
- Other future scenarios beyond the expansion capacity scenario.

Most of the information submitted to the Panel was on the project as filed. This information did not include a basis for detailed assessment even of the potential effects of the project with pipeline throughput at 1.2 Bcf/d, the capacity in the project as filed, because the proponents asserted that they were not in a

position to identify what gas sources beyond the three identified anchor fields would be exploited to fill the unallocated capacity.⁵ Information on the effects of further expansions was understandably also limited, despite Panel efforts. The Panel recognized, however, that the project would induce further development activities and that a realistic assessment of the project and its cumulative effects entailed attention to the range of possibilities beyond the project as filed. The Panel judged expansion at least to 1.8 Bcf/d to be reasonably foreseeable, and also considered the implications of other future scenarios (Mackenzie Panel, 2009: 68–69).

Using its explicit sustainability-based and context-specified criteria, the Panel evaluated the null option and each of the throughput possibilities. The results of this analysis are presented in the next section.

Outcomes of applying the contribution to sustainability test in the Mackenzie Gas Project

This section discusses the Panel's findings and main recommendations. The Mackenzie Panel's final report, signed by all seven panel members, has 679 pages organized into 19 chapters. The report begins by establishing the context, describing the project and the expansion possibilities, and explaining the review process and approach to evaluation. The bulk of the report is devoted to close examination of the major issues, roughly following the broad structure suggested by the five big issues categories (see Box 2). The discussions retain emphasis on cumulative positive and negative impacts and on all matters the Panel reports the views of the proponents and other participants before setting out its own views and recommendations. The ground-breaking analysis, however, is reserved for the final chapter, on 'sustainability and net contribution'.

Chapter 19 of the report reiterates the Panel's approach: centred on the contribution to sustainability test applied to the range of possibilities (alternatives) given the project as filed and reasonably foreseeable expansions, examining the possibilities in light of criteria in the five key sustainability issue categories and paying explicit attention to interactive effects and trade-offs (Mackenzie Panel, 2009: 586). Having considered the specific issues and offered many detailed recommendations through the preceding chapters, the Panel was now in a position to assess the project and associated range of development possibilities both as proposed and as they would be carried out if all of the Panel's recommendations were adopted and implemented.

This last chapter begins with the Panel's core question:

Can we be reasonably confident that the Project as Filed, if built and operated with full implementation of the Panel's recommendations

would deliver valuable and lasting overall benefits, and avoid significant adverse environmental impacts. (Mackenzie Panel, 2009: 586)

The analysis then involved taking the project as filed and the other possibilities — the null alternative and the range of project and expansion options represented by different gas throughput levels (Mackenzie Panel, 2009: 586–588) — and applying the sustainability-based evaluation framework by determining whether and to what extent the project as filed and each of the other possibilities would have positive or negative effects on the 36 specific issues in the five major categories (Mackenzie Panel, 2009: 589–590). The Panel also considered positive and negative interactions among predicted project effects (Mackenzie Panel, 2009: 606–608).

The results of the Panel's analysis

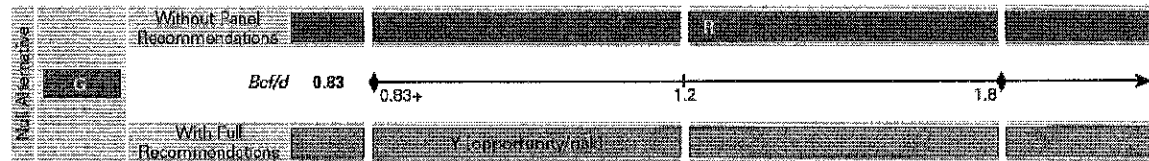
The Panel reported its findings on effects on each of the 36 issue areas and summarized the results of these analyses in five tables, one for each of the five categories of key issues. Each table included summaries of the conclusions and reasoning, and a simple bar graph with the Panel's conclusions about likely sustainability effects represented in red (negative), yellow (uncertain or mixed) and green (positive) bars. Every summary table was followed by summary findings and references to the relevant recommendations on each of the issues in the category. Figure 2 presents a greyscale version of the Panel's bar graphs for the five categories (Mackenzie Panel, 2009: 592–605).

The graphs show the predicted effects of the Mackenzie Gas Project with and without full implementation of the Panel's recommendations for different project sizes (in terms of amount of cubic feet of gas per day that the project would deliver). The figure also shows the results for the no action (or null alternative) on the left side of the graph. Significantly, the Panel found that 'cumulative impacts on the biophysical environment' would be the only category with positive sustainability effects if the project were not built, while there would be negative sustainability effects in the 'equity' category without the project. In the other three categories, the null alternative would have uncertain or mixed effects.

On the basis of these analyses, the Panel provided evaluations of the anticipated contribution to sustainability of each of the gas throughput options and the null alternative and considered the trade-offs involved. Its key conclusions (Mackenzie Panel, 2009: 608–615) were as follows:

- The null option would bring fewer threats to the biophysical environment and retain gas resources for future exploitation but would do nothing to improve the unhealthy social-economic conditions of many communities and was, overall, unacceptable.

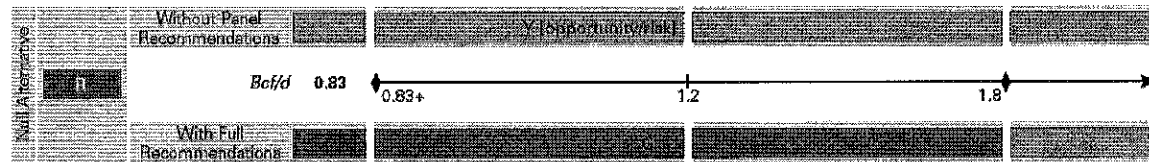
Cumulative Impacts on the Biophysical Environment



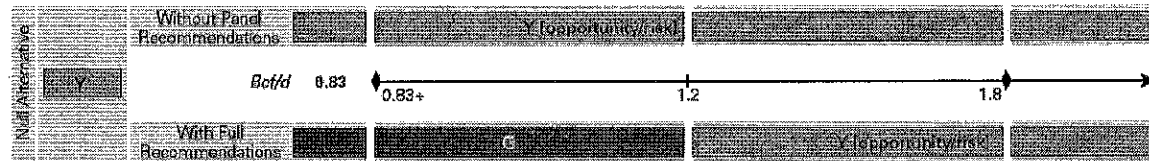
Cumulative Impacts on the Human Environment



Equity Impacts



Legacy and Bridging



Cumulative Impacts Management and Preparedness

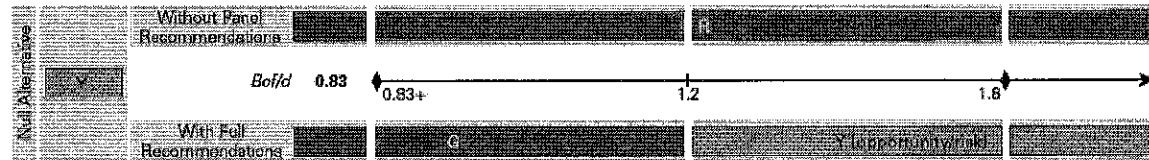


Figure 2. Bar graph summaries of the Panel's analytical findings showing the sustainability effects of the Mackenzie gas pipeline proposal for different amounts of gas delivered (modified from Mackenzie Panel, 2009)

Key:
 Bcf/d — billion cubic feet of gas per day
 R — Red colour in original report (negative sustainability effects)
 Y — yellow colour in original report (uncertain or mixed effects)
 G — green colour in original report (positive sustainability effects)

- The project in some forms was a better option, but only if the Panel's recommendations were fully adopted and implemented.
- Without full implementation of Panel recommendations, no project scenario would reliably promise a positive contribution to sustainability.
- With full implementation of the recommendations, the project at 0.83 Bcf/d would have only modestly positive sustainability effects.
- The project expanded to 1.2 Bcf/d would be more desirable due to higher and more extended economic benefits and associated enhancement of capacity building and bridging opportunities.
- Beyond 1.2 Bcf/d and especially beyond 1.8 Bcf/d, the project and induced developments would bring valuable possibilities but big uncertainties, especially about management capacity.

The Panel concluded that the proposed pipeline project could make a positive contribution to sustainability in the Mackenzie Valley under certain conditions. The null option (rejection of the project

and therefore continuation of current conditions and trends) was found unacceptable. But the Panel concluded that the project would offer positive overall contributions only if the proponent and governments implemented all of the Panel's 176 recommendations (Mackenzie Panel, 2009).

The Panel's recommendations

The 176 recommendations in the report addressed a wide variety of matters. Consistent with the Panel's treatment of the project in the context of its broader regional implications, more recommendations were directed to the federal and territorial governments than to the proponents themselves. While centred on the project as proposed, the Panel's analyses recognized that cumulative effects and legacies were what mattered most. Accordingly, the recommendations included requirements that went well beyond mitigation and well beyond the immediate effects of the project as filed (Mackenzie Panel, 2009: especially chapter 19).

The recommendations directed to the proponents (typically in the form of suggested prerequisites or conditions to be included in regulatory permits) included specific measures to be taken during construction and operations to deal with biophysical concerns such as permafrost uncertainties and potential accidents, malfunctions and emergencies, potential adverse effects on fish and other wildlife (polar bear, caribou, marine mammals and other species of concern), and decommissioning and abandonment planning needs. While most of these proponent-directed biophysical recommendations focused on reduction of risk and damage, some (e.g. those to ensure no net loss of ecological functions) went beyond mitigation. Recommendations to the proponents on social, economic and cultural matters addressed both enhancement of positive effects (e.g. expansion of regional training-for-employment programs, diversity plans including gender equity in employment, and local engagement in effects monitoring) and mitigation of adverse effects (e.g. through harvester compensation, rules for work camps, and substance abuse minimization).

The most significant recommendations, however, were directed to the relevant governments and many of these were wholly or partially devoted to enhancing prospects for net positive sustainability effects. Panel recommendations to governments covered a wide range of specific issues and major topics. In its concluding analysis, applying the sustainability-based framework, the Panel organized the bulk of its recommendations in the five main issue categories as shown in Box 2 (Mackenzie Panel, 2009: 591–606). The next five sub-sections analyse the Panel's recommendations for each of these categories.

Cumulative impacts on the biophysical environment

The Panel recognized that the relevant governments had made inadequate progress in establishing legislated protections, land use plans and resource management regimes for the areas subject to development pressures. It saw the project-led developments not only as a threat to unprotected areas and ecologies but also as a potential driver of protective action and a source of revenues for financial support. Some of the Panel's main recommendations on these matters directed government authorities to mitigate damages and offset losses (e.g. to the Kendall Island Bird Sanctuary), but the main emphasis was on establishing a core framework of law and plans that would provide a foundation for better long-term maintenance of ecological systems, valued ecosystem components and associated traditional activities.

Cumulative impacts on the human environment

The Panel's recommendations anticipated that the project and related developments would put greater stresses on available community services (mental and physical health care, education and training, elder care, policing, etc.), but could also provide revenue streams and other resources for strengthening

these services to deal with existing and new problems. More positively, the Panel recommended initiatives to build individual, community and entrepreneurial capacities to benefit from hydrocarbon economy opportunities and to build a base for more lasting activities. The Panel tended to favour some development beyond the base 0.83 Bcf/d gas throughput in the interests of more revenues to communities through the Aboriginal Pipeline Group's participation, and in the hopes of softened boom–bust effects if the initial construction jobs were followed by more employment in the gradual expansion of gas exploration and field development. At the same time, the Panel was concerned that the pace and scale of development be managed so that they remained within the capacities of the region to capture the benefits and mitigate the damages.

Equity impacts The Panel addressed a range of concerns about potentially inequitable distribution of opportunities and risks both within and between generations. The Panel's recommendations to enhance distributional equity included efforts to clarify revenue sharing between the federal and territorial governments and to improve access to project-related opportunities for women, people in small and remote communities, and northern residents more generally. Recommendations concerning intergenerational equity included those to entrench protected area preservation, build a more diverse economic base and manage the pace and scale of development, in addition to the proposed legacy and bridging efforts.

Legacy and bridging Recognizing the transient opportunity represented by non-renewable resource exploitation, the Panel recommended a set of actions to establish transition planning and build a positive legacy from the project and associated developments. The idea was to use project-related opportunities (e.g. in labour force capacity development) and revenue flows (e.g. to support transition initiatives and a legacy fund) to build 'a more diverse, flexible and lasting basis for livelihoods in the region' (Mackenzie Panel, 2009: 602). Key components of regional significance in addition to the conservation legacy recommendations, were recommendations for active transition planning (assisted by setting long-term goals for economic diversification, assessing alternative future scenarios, and collaborative initiatives) and for allocating a set portion of non-renewable resource royalty revenues to a legacy fund for transition investments. Beyond the regional level, the Panel recommended Canadian government action to meet or exceed existing targets for greenhouse gas emission reduction, and to ensure preferential use of natural gas as a transition fuel.

Cumulative impacts management and preparedness

In addition to focusing on the cumulative effects of the project as filed and as potentially expanded with

induced and other developments, the Panel considered the likely capacities of government agencies and other governance bodies to prepare for and manage both the risks and opportunities represented by cumulative effects at the different gas throughput levels. In the Panel's view adequate cumulative effects management capacity went well beyond effects and compliance monitoring. It included anticipating as well as recognizing emerging concerns and opportunities, analysing as well as identifying trends and interactions, and working towards desirable future scenarios as well as reacting to problems. The Panel's recommendations combined steps to prepare well for cumulative effects management with measures to ensure regulators and other authorities incorporated cumulative effects considerations in decisions affecting the pace and scale of development.

Finally, as is indicated in the summary bar graphs in Figure 2, the Panel's findings were centred on comparison of the project options with and without full implementation of the Panel's recommendations. The Panel had concerns about the likelihood of full implementation, even if governments accepted the recommendations. In its final comments, the Panel offered a remarkably blunt assessment of the governments' past record of inadequate implementation efforts on matters to which they had expressed formal commitment (Mackenzie Panel, 2009: 612–614) and recommended establishment of independent monitoring and reporting on the governments' implementation of Mackenzie case commitments. In its concluding paragraphs, the Panel reiterated that the recommendations were designed as a package and intended to be mutually reinforcing for lasting gains:

If the Project proceeds, and with implementation of the Panel's recommendations, an important opportunity to exploit a valuable nonrenewable resource can be used to build a positive future for the NWT and contribute to overall progress towards sustainability in Canada. (Mackenzie Panel, 2009: 615)

Responses to the Panel's report

The Panel's report was released to the public in electronic form on 29 December 2009 at the same time as it was submitted to the federal, territorial and Aboriginal authorities that the Panel served. Initial press coverage was brief and focused on the Panel's approval of the project, albeit with conditions (CBC, 2009; Quenneville, 2009; O'Meara, 2009). The proponents welcomed the overall approval, while environmental organizations emphasized the recommended conditions.

The limited public discussion of the Panel's analyses and recommendations may have been in part due to the report's release close to New Year celebrations, when most journalists and expert commentators have

priorities other than reading a 679-page report on a proposed project that was apparently no longer economically viable. The report's very long gestation also reduced its public profile. The Panel was appointed in 2004, completed its initial review of the proponent's submission and the public hearings in 2007, and took an additional two years to complete its report. The reasons for this exceptionally long review period merit careful study since slow deliberations tend to frustrate stakeholders and undermine assessment process credibility. In this case a multiplicity of factors seems to have been involved. The breadth of the Panel's mandate and agenda certainly added to the challenges, but Thomas Berger's inquiry into the initial Mackenzie pipeline proposal in the 1970s had essentially the same breadth, and yet he and his team submitted the first volume of their report just over six months after the end of public hearings.

The crucial responses, however, were to be those of the federal and territorial governments and the National Energy Board. In most Canadian environmental assessment processes, the review findings are recommendations to governments and to regulatory agencies with legislated decision-making authority. In this case the recipient governments and agencies were required under the Mackenzie Valley Resource Management Act (section 137 and subsection 141(6)) to consult with the Panel before modifying the recommendations for the purposes of decisions.

The National Energy Board, which is responsible for project licensing in such cases, accepted many of the Panel's recommendations directed towards it but concluded that some of the Panel's major concerns, especially about cumulative effects and pace and scale management, could not be addressed in the scope of licensing decisions on the project as filed (NEB, 2010a, b). In effect this meant rejecting the Panel's contention that the project would deliver positive sustainability contributions only if all of its recommendations (including the key ones on cumulative effects and pace and scale management) were adopted and implemented.

The federal and territorial governments have broader responsibilities and powers for acting on the Panel's most significant recommendations about establishing the conditions for a beneficial project, including pace and scale management. Their joint reaction was more seriously negative than the National Energy Board's. In their formal response, issued in November 2010, the federal and territorial governments accepted 11 of the 115 Panel recommendations directed to the governments, claimed to have 'accepted the intent' of 77 more, and rejected 27 (Canada and the Northwest Territories, 2010: 5). Most of the accepted recommendations concerned mitigation steps. Close examination of the 'accepted the intent cases' reveals a remarkably creative understanding of the term 'accept'. In its reply to the governments on the draft government responses the Panel observed:

Governments have qualified their acceptance of some Recommendations to such an extent that the difference between 'accept the intent' and outright rejection is not easy to discern. (Mackenzie Panel, 2010: 2)

The fully rejected recommendations included the Panel's major proposals to facilitate sustainability gains (especially through cumulative effects anticipation, pace and scale management, use of gas as a transition fuel, community conservation plans and land use plans, and dedication of a portion of non-renewable resource revenues to legacy funding). In defence of 20 of the 27 rejections, the governments claimed that (despite the contribution to sustainability principle in the Panel's terms of reference) such matters were outside the Panel's mandate. The two other major stated reasons for rejecting recommendations were unwillingness to 'fetter the discretion of future decision makers' or 'constrain future development in the North' (Canada and the Northwest Territories, 2010: 5).

There is no reliable public information about whether the underlying drivers were aversion to the costs or other challenges of transition planning, or ideological opposition to pace and scale management, or fear of the spreading effects of accepting this precedent, or some combination of these and other factors. On one matter (the Panel's recommendation to the Government of the Northwest Territories to allocate a portion of non-renewable resource revenues to a dedicated transition fund) the territorial government rejected the Panel's recommendation (as outside the Panel's mandate) even though the government had already initiated public consultations on the establishment of such a fund (GNWT, 2010). Overall, however, the governments were clearly not willing to accept the conclusions of a reasonably rigorous sustainability-based assessment.

The end effects of these current government positions on the project are at best uncertain. The federal government formally approved the National Energy Board certificate for the project in March 2011 but the certificate expires if construction does not begin before the end of 2015 (NEB, 2011: 30). The proponent's Mackenzie project team has been dispersed and a corporate decision to proceed awaits a basis for project profitability — confidence that gas prices will rise substantially and/or an especially generous fiscal deal with the indebted federal government. Neither seems imminent. By the time the proponents judge that the project is economically attractive, government views on some of the Panel recommendations may have shifted.

Discussion

The analytical work of the Mackenzie Panel stands, in Canada at least, as the standard for sustainability-

based environmental assessment and legacy building. It has provided an explicitly demonstrated approach that is available to be adopted, adapted and advanced by others. As an application of a contribution to sustainability test the main strengths of the Panel's work centre on integration of the following seven components:

- Recognition that a comprehensive approach to complex and interrelated socio-economic and biophysical effects is needed for a realistic understanding of the short and long-term implications of proposals and alternative options.
- Comparative evaluation of options with explicit emphasis on cumulative effects and implications for building desirable and resilient futures.
- Adoption of an explicit set of evaluation and decision criteria, based on the generic requirements for progress towards sustainability but specified in light of the significant characteristics, concerns and opportunities of the case and context.
- Explicit attention to interactive effects and trade-offs.
- A focus on the one-time opportunity character of non-renewable resource exploitation undertakings and the associated need to use these as a bridge to more lasting options.
- Commitment to an open and credible public process.
- Attention to broader strategic issues (e.g. concerning conservation planning, capacity building, legacy and transition funding, use of natural gas as a transition fuel, and requirements for effective national greenhouse gas emission reduction).

This package would seem to be broadly applicable to most assessment cases, though the specifics would vary (e.g. for renewable resource projects and undertakings of lower strategic significance).

The Panel's work also had limitations, from which lessons may be drawn or questions pursued. Most obviously, the Panel failed to win acceptance from the government authorities it was established to advise. Perhaps this was in part because the Panel (unlike Thomas Berger in the 1970s Mackenzie pipeline inquiry) failed to win favourable public attention, because the Panel lost credibility by taking so long to report, or because it did not do a good enough job of anticipating resistance and selling its recommendations. Nevertheless, the deep divide between the Panel's conclusions and the governments' response suggests a more fundamental issue. As was noted at the beginning of this paper, the pursuit of sustainability is about reversing undesirable trends that are rooted in conventional thinking and practice. While that does not necessarily pose a problem for all sustainability-based assessments, the Mackenzie case suggests that serious attention to sustainability criteria may often lead to conclusions and recommendations that challenge conventional authorities. How best to deal with that problem is likely to

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depend heavily on the possibilities of particular jurisdictions, but is a worthy theme for further study and experimentation.

A second area of difficulty for the Panel was its role combining project and strategic level assessment. Although the Mackenzie Panel benefited from the long history of public debate on pipelines and resource futures in the Mackenzie region, a solid foundation of sustainability-based strategic level planning and assessment had not been established. Consequently, the Panel was left to address a broad sweep of strategic issues in a project-centred assessment. On regional scale strategic issues, the Panel clearly tried to cover all the major concerns. In contrast, the Panel was at the boundaries of its capacities when it addressed the national to global scale issues, for example those surrounding the project's role in a continental scale hydrocarbon system that is a significant and increasing contributor to greenhouse gas emissions. The experience supports the long history of arguments for credible strategic level assessment as a guide for project level deliberations (e.g. Partidário, 1996).

The Panel was forced to evaluate options about which little information was available. The project as filed did not cover the sources of all supply for the initial pipeline gas throughput, and the reasonably foreseeable future development possibilities associated with expanded throughput were poorly documented. Given the minimal predictability of resource development futures, many of the uncertainties were unavoidable. Moreover, the Panel worked to enhance its information base by seeking and reviewing future scenario information from the proponents and other stakeholders (Mackenzie Panel, 2009: chapter 3) and commissioning a study on cumulative effects and scenario analysis (Greig and Duinker, 2007). It also responded to the uncertainties by identifying cumulative impacts management and preparedness as one of its five key issues categories. But these were extraordinary efforts in a project-based assessment process that is not well designed to address larger strategic issues. The experience points to the common need for more regular use of strategic assessment processes that are sufficiently open, well informed and authoritative to provide credible guidance to deliberations on project level undertakings.

Addressing another common difficulty facing environmental assessment reviews, the Panel provided a forthright assessment of governments' poor record in acting on recommendations and commitments. While the Panel report includes no indication that the Panel factored these implementation uncertainties into its overall assessment of likely project effects, it did recommend independent monitoring and reporting in the hopes of improving performance in this case (Mackenzie Panel, 2009: 612–614). This, too, remains a topic deserving further exploration.

Finally, as noted above, the Panel's assessment took far too long, even if substantial delays for court rulings and proponent information are taken into account and if the extraordinary scale and significance of the case are recognized. Because evident inefficiency is well established as a favoured target of assessment opponents, timely as well as rigorous deliberation and decision is crucial, especially where ground-breaking work is involved. The potential for more effective sustainability-based assessments seems likely to depend on processes designed to be both thorough and efficient.

Conclusions and recommendations

The Mackenzie Panel's work built well upon the foundation established by the earlier sustainability-based Canadian panel reviews. It not only set a positive test far beyond that of mitigating significant adverse effects but also showed how that test could be applied using a carefully designed analytical framework covering the key long-term choices. The analysis went beyond the immediate effects of the project and recognized that cumulative effects, equity and legacy were critical. The recommendations focused on delivering a positive overall contribution to sustainability — the ultimate goal of enhancement in environmental assessment.

The desirable next steps include additional elaboration and demonstration of the contribution to sustainability approach in particular assessments, in Canada and elsewhere. The most obvious way to ensure such advance is to establish contribution to sustainability as the mandatory core test in environmental assessment law at all levels. The Mackenzie case illustrates the importance of law and process reform also to spread the underlying thinking beyond project assessments into strategic level policy and planning work.

The Mackenzie Panel's work was especially exemplary in its focus on cumulative effects, its attention to equity and legacy issues and its recognition that the overall pace and scale of development would be more powerful determinants of impacts than the particulars of the project as proposed. No adequate sustainability-based assessment of the gas project would have been possible without emphasis on these matters. Nevertheless, they were and are strategic level considerations that deserved to be

addressed in properly constituted strategic assessments, rather than left to an extraordinary project assessment. More serious strategic assessment, with reliable and credible links to project level assessment, is generally needed in Canada (Gibson *et al.*, 2010). One of its roles should be to entrench the contribution to sustainability test more firmly in law and practice, and to build the capacities of all players — proponents and process participants as well as assessment reviewers and decision makers — to see their objectives and options in the broadly positive light of contribution to sustainability.

Further inquiry and experimentation are evidently also needed to enhance the efficiency of major assessment reviews. Unduly lengthy reviews are longstanding concerns and are typically the product of many factors. It is an open question whether the Mackenzie Panel's report would have appeared sooner if the Panel's terms of reference had not emphasized contribution to sustainability. In these early days of sustainability-based assessment, however, few existing templates are in place for structuring and analysing the broad sweep of interacting considerations, and few reviewers will have established experience. Although the Mackenzie Panel's own contribution is valuable as a working model for adaptation and advancement elsewhere, learning from many more applications will be important.

The governments' mostly negative response to the Mackenzie Panel's recommendations points to an even larger challenge. How can we design and undertake sustainability-based assessments so that they are more effectively influential? No easy answer is likely. After many decades of modern environmental law, requirements to mitigate adverse environmental effects still face substantial opposition. We should not be surprised by resistance to more demanding recommendations that integrate socio-economic and biophysical considerations and seek enhancements for sustainability. Some of the solutions will require more effective use of sustainability-based assessments as means of public education and decision-maker enlightenment. Another set of apparent needs centres on helping assessment participants, including review panel members, to understand better how political power is exerted and how power holders can be moved. In the end, however, the key factor may be persistence — building more capacity and experience in well-conceived and rigorously undertaken assessments that deliver contributions to sustainability.

The imperative to find more sustainable ways of living on this planet can only become more obvious. Despite the current authorities' rejection of sustainability-based assessment advice in this case, the Mackenzie Panel has shown a positive route to better decisions. It has taught us a little more about how to respond to our present challenges by seeking multiple, mutually reinforcing, fairly distributed and lasting gains.

In the Mackenzie case, the Panel's most demanding recommendations proved to be beyond the ambitions

of the authorities that would have to implement them. However, both federal and territorial governments are likely to have plenty of time to reassess their positions. Because of an unanticipated boom in shale gas extraction much closer to markets, gas from the Mackenzie is unlikely to be economically viable for many years (Donville and Carroll, 2010). Meanwhile, the Mackenzie Panel's work stands as Canada's most fully developed approach to the pursuit of enhancement through advanced sustainability-based assessment.

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Notes

1. According to the World Wildlife Fund (WWF, 2010), the very rough but broadly plausible Ecological Footprint analysis indicates that human demands on planetary biocapacity doubled in the past 40 years and in 2007 were 50% above the sustainable carrying capacity. This incorporates, but is not limited to, consideration of the still growing annual emissions of greenhouse gases.
2. One indicator is the number of undernourished people in the world, estimated at 1.02 billion in 2009 by the UN Food and Agriculture Organization (FAO, 2009).
3. The poorest 40% of the world's population gets about 5% of global income. The richest 20% gets 75% of world income (UNDP, 2007: 25).
4. The consortium members as identified by the Mackenzie Panel (2009: xxxi) were Imperial Oil Resources Ltd, Imperial Oil Resources Ventures Ltd, ConocoPhillips Canada (North) Ltd and ConocoPhillips Northern Partnership Ltd, Shell Canada Ltd, ExxonMobil Canada Properties, and Mackenzie Valley Aboriginal Pipeline Limited Partnership (usually called the Aboriginal Pipeline Group).
5. As a result, the proponents provided little assessment of the potential biophysical effects of developing additional fields and associated facilities to expand throughput to 1.2 Bcf/d. They did, however, put considerable weight on the anticipated positive economic effects of the project that would result from revenues to the Aboriginal Pipeline Group, a consortium of Mackenzie Valley Aboriginal organizations that, under a special arrangement with the proponents, would become part owners and recipients of revenue from the project but only at significant levels after expansion of the gas throughput beyond 0.83 Bcf/d.

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