Mining, Minerals and Sustainable Development North America

Seven Questions to Sustainability

How to Assess the Contribution of Mining and Minerals Activities

Task 2 Work Group
MMSD North America

iisd International Institute for Sustainable Development / Institut international du développement durable

MMSD NORTH AMERICA

World Business Council for Sustainable Development

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MMSD

World Business Council for Sustainable Development

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Preface

In 1999, nine Chief Executive Officers of some of the world's largest mining companies came together in Davos, Switzerland. Driven by a concern that a disconnect had emerged between mining/minerals-related practices and the values of today's society, they voiced a concern that their "social licence to operate" was in jeopardy.

Working through the World Business Council for Sustainable Development (WBCSD), they subsequently commissioned the International Institute for Environment and Development (IIED, London) to undertake a global review of practices related to mining and minerals. The resulting project, "Mining, Minerals and Sustainable Development (MMSD)," has been driven by the following four goals:

1. to assess global mining and minerals use in terms of the transition to sustainable development—its track record in the past and its current contribution to and detraction from economic prosperity, human well-being, ecosystem health and accountable decision-making;
2. to identify if and how the services provided by the minerals system can be delivered in accordance with sustainable development in the future;
3. to propose key elements of an action plan for improvement in the minerals system; and
4. to build a platform of analysis and engagement for ongoing cooperation and networking between all communities of interest.

As part of its delivery mechanism, MMSD Global created a suite of regional activities with partners operating in Southern Africa, South America, Australia and North America. In North America, the International Institute for Sustainable Development (Winnipeg) has served as the regional partner working in concert with the Mining Life-Cycle Center, Mackay School of Mines, University of Nevada, Reno.

For its part, the participants of MMSD–North America opted to pursue five tasks in discharging their mandate:

Task 1: Story/Profile

Objective 1A: to develop a profile of the North American mining industry (U.S. and Canada) from the perspective of the nature of the companies that comprise the industry.

Objective 1B: to articulate the contribution and implications of mining (to people and their communities, to ecosystems, to economies) through the eyes of various communities of interest and as it has changed over time.

Task 2: Test/Guideline for Sustainability

Objective 2A: to develop a set of *practical* principles, criteria and/or indicators that could be used to guide or test the exploration for, design, operation and performance monitoring of individual operations, existing or proposed, in terms of their compatibility with concepts of sustainability.

Objective 2B: to suggest approaches or strategies for effectively implementing such a test/guideline.

Task 3: Agenda for Change

Objective 3: to collaboratively develop an "Agenda for Change" comprising specific actions and timelines for the North American mining industry and related communities of interest to meet in moving towards sustainable development.

Task 4: Scenarios

Objective 4A: to develop of a set of scenarios that bracket the likely futures to be faced by the North American mining and minerals industry and the related communities of interest.

Objective 4B: to use the scenario-building exercise as a means to identify and discuss:

- risks and opportunities;
- issues, challenges and areas of consensus and disagreement on their resolution; and
- potential prescriptions (aimed potentially at any or all of the communities of interest) for adjusting mining- and minerals-related policy, practices, behaviour and infrastructure.

Task 5: Final Report

Objective 5: to synthesize and communicate the results of MMSD–North America.

This document summarizes the work of the Task 2 Work Group.

Disclaimer

To as great extent as possible, participants in the activities of MMSD North America were drawn from a range of interests including companies (small, intermediate, large, service), mining-affected communities, First Nations/Native Americans, non-government organizations, government, organized labour and universities (teachers, researchers, students).

While participants were asked to share their knowledge and expertise, they were not asked to "represent" any organization. Further, while a great effort was made to incorporate everyone's perspective and reach consensus on issues, neither participants nor their affiliated organizations (where they existed) were asked to endorse the results.

Ultimately, however, responsibility for the final outcome must be clearly assigned. In this case, while credit for the richness of this work lies with all participants, limitations that remain rest with us.

R. Anthony Hodge
Michael R. McPhie
Co-facilitators, Work Group 2

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Executive Summary

Task 2 of MMSD North America set out to develop an approach to assessing how a mining/mineral project or operation contributes to sustainability. Specifically, the following objectives were established:

1. to develop a set of *practical* principles, criteria and/or indicators that could be used to guide or test the exploration for, design, operation, closure, post-closure and performance monitoring of individual operations, existing or proposed, in terms of their compatibility with concepts of sustainability; and
2. to suggest approaches or strategies for effectively implementing such a test/guideline.

Pursuing these objectives is important because meeting them:

1. leads to a clarification of what the much-debated concepts of sustainable development and sustainability mean in practice for the mining/minerals industry;
2. helps to achieve a consistency across applications and phases of a project/operation life-cycle that in turn will lead to a reduction of confusion and the realization of efficiencies; and
3. contributes to clarifying the economic, environmental, social and cultural benefits, costs and risks of bringing the idea of sustainability from theory to practice and in so doing, brings clarification to the overall case for sustainability in general and the business case in particular.

The initiative led to the design of a framework to guide the assessment of whether or not a project or operation's net contribution to sustainability is positive over the long term.

For each of seven components, a question is posed as a means of assessing whether the net contribution to sustainability over the long term of a mining/mineral project or operation will be positive or negative.

Each of the questions is articulated in a detailed form in this report. An "ideal" answer is offered and a hierarchy of objectives, indicators and specific measurements is suggested as a starting point for application. In this way, the single initial motivating question—is the net contribution positive or negative in the long term?—cascades down into progressively more detailed elements that can be tailored to the activity being considered and its own particular site-specific conditions. An example for the "environment" follows:

Is the integrity of the environment assured over the long term?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
*3. **Environment.*** Will the project or operation lead directly or indirectly, to the maintenance or strengthening of the integrity of biophysical systems so that they can continue in post-closure to provide the needed support for the well-being of people and other life forms?	The project or operation will lead directly or indirectly to the maintenance or strengthening of the integrity of biophysical systems as indicated by:		
	3.1 Ecosystem Function, Resilience and Self-organizing Capacity. A reasonable degree of confidence on the part of all communities of interest that ecosystem function, resilience and self-organizing capacity will be maintained or improved over the long term.	• Projected long-term well-being of water systems and renewable resources in the area of the activity.	• Population effects of project on indicator species.
	3.2 Ecological Entitlement	*(examples)*	*(examples)*
	3.3 Full Ecosystem Costs, Benefit and Risks	*(examples)*	*(examples)*
	3.4 Responsibilities and Sureties	*(examples)*	*(examples)*
	3.5 Environmental Stress and Action to Ensure Ecosystem Integrity	*(examples)*	*(examples)*

In applying the framework, values come into play and there is not necessarily a unique or "right" answer to the seven questions. Furthermore, in acting on the results of any assessment, a company, community or government will inevitably have to weigh certain trade-offs. In doing so, the rules governing such trade-offs, along with fair processes for their

application, need to be established. However, the starting point for all of this is the identification of the considerations that are fed into the decision-making process. It is this starting point set of considerations that is offered here, *not the decision-making process itself*.

This approach is offered as guidance to operators, owners, investors, insurers, communities, indigenous people, non-government organizations and others. Potential applications include: early appraisal; planning; financing and insuring; licensing and approvals; internal corporate reviews; corporate reporting; and external reviews.

The questions are intended to be applied against any set of facilities and activities comprising an individual project or operation (existing or proposed): exploration, mining, milling, smelting, refining; or primary metals manufacturing, fabrication or recycling. The spatial scale for application in any case will be governed by the "reach" of site-specific implications as they ripple out into human society and the environment. The full project life-cycle sets the time horizon from exploration through to post-closure. Operations of all sizes are targeted.

In follow-up to this work, the Work Group recommends two sets of actions:

1. Pilot test the "Seven Questions Framework" at a number of existing projects that span both developed and developing country examples of:

    1.1 an operation nearing the end of its production life;

    1.2 an operating primary metals manufacturing operation that includes a recycling capacity;

    1.3 an exploration project;

    1.4 a project at advanced feasibility that is seeking regulatory approval;

    1.5 a project in closure phase;

    1.6 a project in post-closure phase;

    1.7 a community-based assessment of an adjacent operating facility in mid-production life;

    1.8 an indigenous peoples'-based assessment of an adjacent operating facility in mid-production life; and

    1.9 a non-governmental-organization-based assessment of an operating facility of concern.

Pilots 1.1–1.6 should be led by companies; pilot 1.7 by a mining-dependent community; pilot 1.8 by a First Nations/Native American community; and pilot 1.9 by a non-government organization.

2. Reconvene the Work Group following completion of five of these pilots to:

    2.1 review the lessons learned and appropriately modify the approach; and

    2.2 undertake a comprehensive review of the implementation issue.

As more experience is gained, the "seven questions" approach will be refined and adjusted. In the continuing, iterative process that will unfold, the collaborative effort that has characterized efforts to date should be maintained. In this follow-up, the International Institute for Sustainable Development (IISD) has offered to continue in its role as Work Group facilitator.

1. Introduction

Task 2 of MMSD North America set out to develop an approach to assessing how a mining/mineral project or operation contributes to sustainability. Specifically, the following objectives were established:

1. to develop a set of *practical* principles, criteria, and/or indicators that could be used to guide or test the exploration for, design, operation, closure, post-closure and performance monitoring of individual operations, existing or proposed, in terms of their compatibility with concepts of sustainability; and
2. to suggest approaches or strategies for effectively implementing such a test/guideline.

In September 2001, a Work Group of about 30 individuals was convened. Participants were drawn from a range of interests including companies (small, intermediate, large, service), mining-affected communities, First Nations/Native Americans, government, organized labour, universities (teachers, researchers, students) and non-government organizations. Participants were asked to share their knowledge and expertise; they were not asked to represent any organization. Further, while every effort was made to incorporate everyone's perspective and reach consensus on many issues, participants were not asked to endorse the results. Thus, what is presented in this document is the reflection of a multi-party deliberation involving a broad range of perspectives. However, the final treatment of the various elements may not be fully supported by all participants.

Ten pieces of recent (ongoing, in some cases) relevant work were identified (see Appendix) as a starting point for deliberations. The material reflects a range of perspectives including government (sustainability and environmental assessment), indigenous peoples, environmental non-governmental organizations, the financial services industry and mining/mineral companies. Authors of eight of these papers participated in the Work Group.

A preliminary summary of this work was prepared and the first workshop was held in Tucson, Arizona, October 11–13, 2001. Workshop results were then put to the 100-person North American Mining Dialogue held in Vancouver, November 7–9, 2001. Comments received from the Dialogue, along with the Work Group, led to two additional iterations of reporting. Motivated by the identification of this task as a high priority at the Dialogue, a second workshop was held near Victoria, British Columbia, February 3–5, 2002. A fourth draft report was then produced and reviewed by the Work Group prior to being finalized as this document.

This initiative led to the articulation of a set of seven questions to be posed as:

- a means of assessing whether the net contribution to sustainability over the long term of a mining/mineral project or operation will be positive or negative;
- a way of discovering how current activities can be improved and aligned with the emerging concept of sustainability; and
- a basis for continual learning and improvement.

An "ideal answer" to each of the seven questions is also offered. Each answer has a number of components for which indicators and specific metrics can be identified. In practical application, the details of these indicators and metrics depend on the phase of the project or operation life-cycle that is being considered as well as the site-specific conditions. In this work, examples of objectives, indicators and metrics are offered to further illustrate various topics and to provide a basis for discussion in any site-specific application. These examples are a starting point only. The objectives, indicators and metrics that are ultimately needed will only evolve through a series of practical pilot tests that cover different phases of the project life-cycle and different social, cultural and environmental conditions.

Together, the questions, answers, indicators and metrics serve as an overall framework for assessing a project or operation from the perspective of sustainability. In applying the framework, values come into play and there isn't necessarily a unique or "right" answer—the "ideal answers" that are listed are based on today's understanding and beliefs. As knowledge evolves, values change and what is considered the "best" or "ideal" answer today may well shift tomorrow. Similarly, the questions themselves are based on today's views and perspectives and over time these may also be refined, eliminated or replaced based on the evolution of values. Because of this value-dependency, the question of who participates in making an assessment is important.

Furthermore, in acting on the results of any assessment, a company, community or government will inevitably have to weigh certain trade-offs: many that are small in significance; some that are of great significance. In doing so, the rules governing such trade-offs along with fair processes for their application, need to be established. However, the starting point for all of this is the identification of the considerations that are fed into the decision-making process. It is this starting point that is offered here, *not the decision-making process itself*.

The decision-making process may vary depending on the particular local culture of administrative/legal, political, market, corporate and personal practices. Regardless of such variations, the idea of sustainability calls for increased transparency and involvement in decision-making on the part of implicated communities of interest. This principle is entrenched in this work. It reflects a continuing evolution of practices and laws affecting all companies and industries—including mining—that has resulted in more community involvement and environmental awareness.

In developing these questions and the underlying hierarchy of data and information, the issue of existing standards and objectives arises. In many instances, individual states and companies are being encouraged by elements of civil society as well as industry and professional associations to exceed existing standards and objectives. Regardless, international conventions, treaties and agreements set a minimum level of performance for a number of key topics of interest including human rights; occupational health and safety; public health; and the environment.

This document is offered as guidance in the process of assessing a project's or operation's contribution to sustainability. It is intended to stimulate dialogue and learning. It assumes that mining and mineral activities are necessary and legally permissible but that assessing the contribution to sustainability is an essential component of good decision-making.

Many of the concepts that are at the heart of the Seven Questions to Sustainability are new and evolving. This work, therefore, should be considered a step in a continuing process. However, much common ground emerged among the varied interests that came together through this initiative. That common ground is reflected in the pages that follow.

2. Sustainability, Mining and the Non-renewable Character of Minerals

Though values vary greatly in detail within and between cultures, at the heart of the concept of sustainability there is a fundamental, immutable value set that is best stated as "parallel care and respect for the ecosystem and for the people within." From this value set emerges the goal of sustainability: to achieve human and ecosystem well-being together. It follows that the "result" against which the success of a mine (or any human activity) should be judged is the achievement of, or the contribution to, human and ecosystem well-being together.

Seen in this way, the concept of sustainability is much more than environmental protection in another guise. It is a positive concept that has as much to do with achieving well-being for people and ecosystems as it has to do with reducing stress or impacts.

In short, it implies the need to achieve a net environmental and human benefit (or in other words, to maintain or improve human and ecosystem well-being) if mining is to be considered as contributing positively to sustainability. Conversely, if a given mining/mineral project or operation leads to a net degradation of human and ecosystem well-being, it must be described as reducing the potential for sustainability. In such cases, if the decision to proceed is made, decision-makers, other interests and the public should understand the implications from a sustainability perspective.

Taken together, these ideas veer sharply away from thinking in terms of a "trade-off," human vs. ecosystem well-being. There are obviously hundreds of small trade-offs in any practical application: between interests, between components of the ecosystem, across time and across space. However, in a macro sense, the idea of sustainability calls for human and ecosystem well-being to both be maintained or improved over the long term. Maintaining or improving one at the expense of the other is not acceptable from a sustainability perspective because either way, the foundation for life is undermined.

The above "positive contribution to sustainability" criterion is different from, though built upon, the "mitigation of adverse effects" criterion that is the focus of traditional environmental and social impact assessments. The implications of the shift are twofold. On one hand, the positive orientation opens the door to a much fuller treatment of the benefits that result from mining activities than has traditionally been the case with impact assessment approaches. On the other, the same positive orientation sets the assessment bar higher.

These assertions do not negate the fact that mining causes impacts, or that human and/or ecosystem well-being might be degraded and permanent ecosystem or social change might occur in the vicinity of the site. However, when the full life-cycle of projects/operations and products is considered, a net positive contribution to human and ecosystem well-being should be realized. If not, the mining/mineral activity will not be contributing positively to sustainability.

In practical application, expression of the sustainability duality—human plus ecosystem well-being—is very culture-dependent. In the developed world, the environmental values that have grown particularly over the past 30 years now serve as a strong influence on development decision-making. As part of this, the mind-set of decision-makers is expanding to include consideration of the implications of today's action for future generations. In contrast, hunger, poverty and health concerns are often the driving forces and ethical imperatives in much of the developing world. The urgency of feeding, clothing, housing and providing health care for those now living is simply too great to allow much time to reflect on the needs of those not yet born. These perspectives are not mutually exclusive. However, simultaneous expression of both without care and sensitivity can, and does, lead to tension.

Remarkably, the fact that minerals are non-renewable (or stock) resources, and, in some sense, fixed in absolute quantity, turns out to be relatively unimportant from a sustainability perspective—at least at the macro scale. The non-renewable character of minerals received a great deal of attention in the literature from 1950 into the 1970s. However, the long statistical record of continued output at relatively constant prices, together with growing understanding first of environmental issues and then of sustainability, has set this focus aside. Instead, the focus is now on mining as an activity and its implications for the communities and renewable resources within which minerals are imbedded.

At any given site, whether it be a mining, smelting, refining, primary metals manufacturing or recycling operation, there is a beginning and an end. In that sense, no mining/mineral activity can be expected to have an indefinite lifespan. However, the implications of that activity (not only as a direct result of the activity, but also through the product that is produced) go on indefinitely. In that sense, mining/mineral activities serve as a bridge to the future. The sustainability challenge is to ensure that the implications are net positive for people and ecosystems: it is the well-being of human society and the enveloping ecosystems that need sustaining. Limited-term mining projects can serve sustainability objectives if they are designed and implemented in ways that build viable long-term capacities, strengthen communities and rehabilitate damaged ecosystems.

The approach to implementing sustainability concepts reflected in this discussion is aimed at re-establishing a sense of confidence that:

- people can and will have a meaningful opportunity to participate in the decisions that affect their future;
- resources will be made available to ensure that they will have the capacity to participate effectively;
- acceptable post-closure outcomes will be achieved in spite of possible economic and social dependencies that can arise in a community during the life of an operation;
- all communities of interest, including companies and governments, will fulfill the commitments that they make regarding human (social, cultural, economic) and ecological conditions;
- a greater degree of alignment in expectations and actions can be achieved across all communities of interest (project, company, community, regulators, etc.) and along the full life-cycle from exploration through post-closure; and
- projects which do not adequately demonstrate sustainability can be questioned and their viability addressed.

Together, the above elements amount to creating a sense of security and faith in the future—whether it be from the perspective of a company, a community or the ecosystem.

"Sustainability" involves the maintenance of certain necessary or desired characteristics of human society and/or the ecosystem. However, deciding what is necessary or desired is a values-based process that will depend on who is deciding. When more than one set of values is implicated, the process of resolving values-based differences becomes critically important. Therefore, in bringing ideas of sustainability from theory to practice, the "how" (the process of application) is as critical as the "what" (the substance of the application). This point stands as clear rationale for why this task must include a review of the effectiveness and adequacy of the processes of engaging the various communities of interest that are implicated by a mining/mineral project or operation.

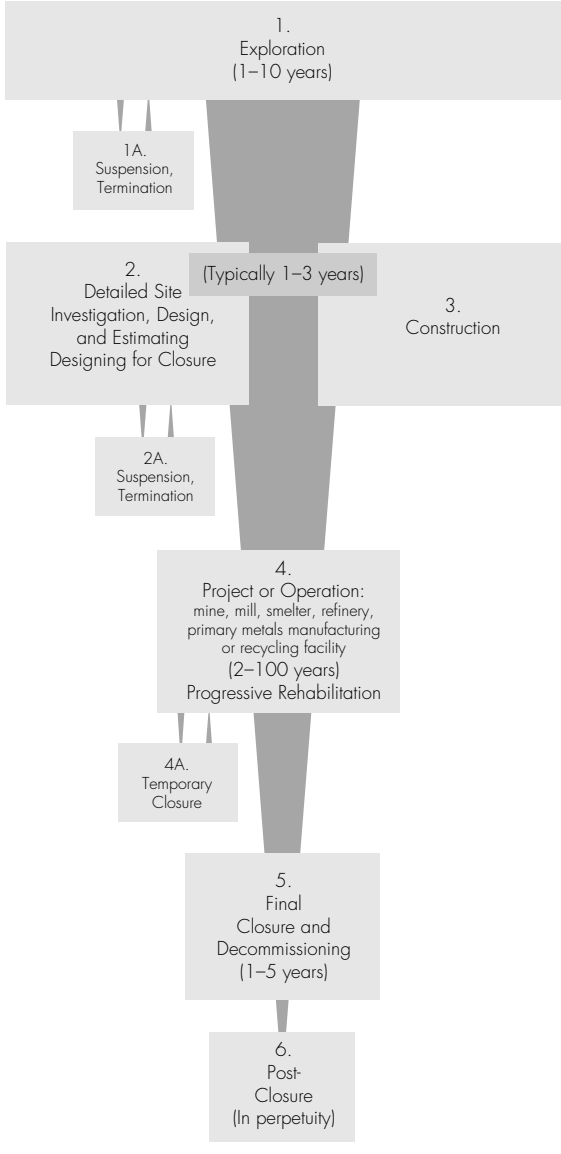
3. Scope of the Seven Questions

Focus of Interest and Application

The focus of interest and application for this framework is that of the set of facilities and activities comprising an individual (existing or proposed) project or operation. This could be exploration; mining; milling; smelting; refining; primary metals manufacturing or recycling; reclamation; or closure.

The framework is intended to provide practical guidance throughout the entire life-cycle for projects and operations of all sizes. At the small end of this scale are the individual and family operations found in the placer mining areas of California, Oregon, Idaho, Alaska, British Columbia and Yukon, as well as the large number of artisanal miners in other countries. At the other end of the scale lie the large surface and underground mines, smelters, refineries and primary manufacturing plants (e.g., aluminum) of the major corporations. There is an enormous range between these two extremes. Translation of this framework for effective application across the entire spectrum will require careful review and adaptation to site- or sector-specific conditions.

Figure 1. Project Life-cycle.



The site-specific focus of this work does not preclude the need for a broad assessment to address cumulative and regional implications (positive and negative) and other matters more effectively and efficiently dealt with at a high strategic level.

Even though this work is drawn from North American experience and inevitably reflects American and Canadian culture, it is essential that it be sensitive to cultures and conditions found elsewhere. This is because of the high activity level of North American-based firms elsewhere and offshore-based companies operating in North America. Second, the entire mining/minerals industry is so global in nature that anything put into practice in one country will influence, and be influenced by, practices in other countries. In short, an isolated perspective on assessing a project's or operation's contribution to sustainability is not defensible or even realistic.

System Boundaries and Spatial Scale

The system of interest comprises the human and ecological system influencing, influenced by or potentially influenced by the operation, directly and indirectly. Thus, the spatial scale of analysis for any given application will be determined by the "reach" of site-specific implications as they ripple out into human society and the natural ecosystem.

Time Horizon

The time horizon of interest and application is that of the full facility or operation life-cycle shown in Figure 1. It spans exploration through post-closure. Thus, short- and long-term concerns both come into play. Each element of this life-cycle needs to be considered. Doing so reinforces recognition that most mining/mineral activities are best thought of as "bridging" activities because they are inherently temporary activities.

4. The Seven Questions in Summary

This initiative led to the articulation of seven questions to be posed in assessing a mining/mineral project's or operation's contribution to sustainability. They are shown in short form in Figure 2.

Figure 2. The Seven Questions at a glance.

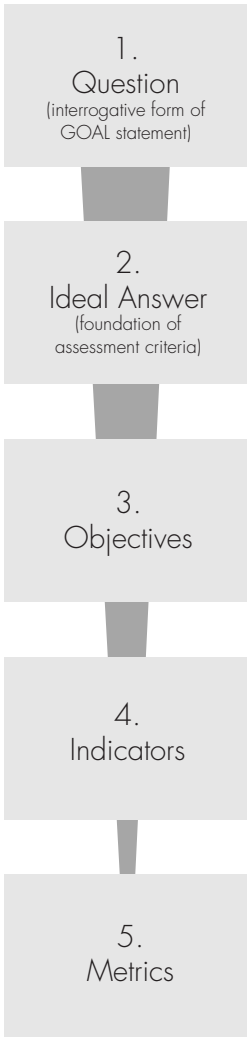
The seven-part numbering used in Figure 2 and throughout this work is intended as an aid to communication. It does not imply a particular sequencing of steps or prioritization of topics. In practice, application as a whole set is essential, recognizing that the relative weight of each may vary considerably from site to site.

For each consideration, a question is posed for any stage of the project life-cycle or for the life-cycle as a whole. These questions are interrogative forms of a goal statement. The power of this format, and the reason that it is used here, is that it forces clarity in what is being sought. This approach is taken from the experience of auditors and evaluators.

Box 1 provides the complete detailed form of each question. Question 1 addresses ***relationships***—the state of the engagement that exists between the project or operation and the various implicated interests. Questions 2 and 3 are focused on ultimate ***ends***—the outcomes (the well-being of people and ecosystems) that must be assessed to know the success of the project. Questions 4, 5 and 6 focus on ***means***—the means that are available to achieving human and ecosystem well-being (activities within the market economy, traditional and non-market activities, the institutional arrangements, and systems of governance). The seventh question addresses ***overall integration and continuous learning***—the synthesis that allows us to see not only the component parts, but the whole system, and not simply as a one-time snapshot but periodically over time so that continuous learning can be facilitated.

For each question, the development sequence shown in Figure 3 was followed.

Figure 3. Framework development sequence.



Box 1. Seven Questions to Sustainability in Detailed Form

1. ***Engagement.*** Are processes of engagement committed to, designed and implemented that:
   - ensure all affected communities of interest (including vulnerable or disadvantaged sub-populations by reason of, for example, minority status, gender, ethnicity or poverty) have the opportunity to participate in the decisions that influence their own future; and
   - are understood, agreed upon by implicated communities of interest, and consistent with the legal, institutional and cultural characteristics of the community and country where the project or operation is located?
2. ***People.*** Will the project/operation lead directly or indirectly to maintenance of people's well-being (preferably an improvement):
   - during the life of the project/operation; and
   - in post-closure?
3. ***Environment.*** Will the project or operation lead directly or indirectly to the maintenance or strengthening of the integrity of biophysical systems so that they can continue in post-closure to provide the needed support for the well-being of people and other life forms?
4. ***Economy.*** Is the financial health of the project/company assured and will the project or operation contribute to the long-term viability of the local, regional and global economy in ways that will help ensure sufficiency for all and provide specific opportunities for the less advantaged?
5. ***Traditional and Non-market Activities.*** Will the project or operation contribute to the long-term viability of traditional and non-market activities in the implicated community and region?
6. ***Institutional Arrangements and Governance.*** Are the institutional arrangements and systems of governance in place that can provide certainty and confidence that:
   - the capacity of government, companies, communities and residents to address project or operation consequences is in place or will be built; and
   - this capacity will continue to evolve and exist through the full life-cycle including post-closure?
7. ***Overall Integrated Assessment and Continuous Learning.*** Has an overall evaluation been made and is a system in place for periodic re-evaluation based on:
   - consideration of all reasonable alternative configurations at the project level (including the no-go option in the initial evaluation);
   - consideration of all reasonable alternatives at the overarching strategic level for supplying the commodity and the services it provides for meeting society's needs;
   - a synthesis of all the factors raised in this list of questions, leading to an overall judgment that the contribution to people and ecosystems will be net positive over the long term?

For each question, an "ideal" answer from the perspective of sustainability is also offered. Each answer has a number of components that provide the focus of objectives. For each of these, indicators and specific measurements or metrics can be identified, the details of which will be dependent on both the phase of the project/operation life-cycle that is being considered and the site-specific conditions.

There are two purposes for starting with an "ideal" answer. First, by stating an ideal, an end-point is identified that sets a direction for progress. That direction is more important than the specifics of the end point (which will likely change over time in any case). Second, it begins the process of developing the criteria that will be needed to judge whether progress is being achieved over time and assess its adequacy.

The full details of the resulting matrices are found in Section 8.

The ideal answers presented here are not unique. In any given application, the implicated interests may well choose to articulate a different ideal answer that works more effectively in that situation. What is offered here can be used as a generic start to that process. In offering these ideal answers, the bar has been set high, but the benefits to be achieved are significant.

The seven fundamental questions with the "ideal answers" and associated information matrix provide a framework for guiding a sustainability assessment. The framework serves to highlight key considerations that must be fed into a sustainability assessment. Some of these considerations deal with system components (e.g., people); some cut across all aspects of the system (e.g., engagement). For this reason, the framework should not be thought of as a system model. Such models attempt to reflect system elements and their relationships. In this case, the complexity of the human/ecological system from which these considerations are drawn is well beyond what is captured.

For system "purists" this approach may seem unsatisfactory. However, the simple test of success here is whether this package serves as a practical stimulus to achieving movement toward sustainable development.

5. Comments by Life-cycle Phase

The application of this approach is intended to span all phases of the project or operation life-cycle. However, specifics of that application will vary depending on the phase.

Exploration

Exploration is the starting point of the entire mineral project life-cycle. However, only one out of 1,000 exploration projects ever evolves to the next "level" of activity (often more exploration).

People conducting exploration generally have an objective of getting into and out of areas quickly, moving on to the next evaluation. It is highly competitive and therefore secretive by design. Furthermore, sometimes public discussion can lead to unintended and unjustified expectations that can subsequently cause difficulty when they are not realized.

While the extent of the human and environmental implications is below that of later phases of activity, they can be profound. In at least some cases, exploration is also the first time when the desirability or appropriateness of mining in a particular area is first considered.

Perhaps of greatest importance, because exploration marks the start of any mining/mineral project, the nature of the relationship that is established between the exploration team and affected communities of interest, sets the tone of relationship from then forward. Only in the last few years have models for appropriate engagement during exploration begun to emerge.

In short, the exploration phase is marked by very particular challenges.

Design and Construction

Relative to other phases of activity, the design and construction phase is short. However, the typically brief and intense set of activities in this phase can lead to devastating implications if not carefully managed.

The construction workforce is usually much larger than the eventual operating workforce and, with their short-term presence, the social implications for any nearby communities can be enormous. Careful management of practices is essential to minimize the generation of social and environmental stresses. However, many of the activities are undertaken by sub-contractors who may or may not follow the same practices as the project owner or manager. Effective systems (policy, management, oversight and incentives) for ensuring good practices are essential.

This phase of activity also marks the time that formal approvals are sought and received. During approvals processes, key opportunities exist for engagement with communities of interest.

Operation

The operation phase typically receives the greatest amount of attention. When the general public conjures up an image of a mining/mineral project or operation, it is the operation phase that they think of whether the activity is mining, smelting, refining, metals manufacturing or recycling. Economic, social, cultural and environmental implications are relatively well understood although their treatment is uneven in practice.

Closure: Temporary, Final and Post

Temporary closure (due to changing metal prices, accident, disaster or labour strife) rarely receives the pre-event planning and consideration that it should. Though often a temporary closure can run a few short days or weeks, sometimes so-called temporary closures can turn into years.

While concepts of "design-for-closure" date from the 1970s where they were first used at the proposed Cinola Gold Mine on the Queen Charlotte Islands, concepts of sustainability now demand "design-for-post-closure" and reach to the point when ideally, a proponent can walk away with dignity.

Design-for-post-closure involves a significant increase in the time horizon governing project design criteria whether the focus be social or environmental in nature. Furthermore, successful design-for-post-closure identifies a need for involvement of those affected by post-closure conditions from the earliest phases of any project. Fortunately in the case of closure and post-closure, research and experience have produced a number of successful models. One thing emerges from all of them: "succeeding custodians" (to the extent that they are now living) need to be at the table. It is only with their presence that it is possible that their values can be factored into project implementation, that the bridging role of a mining/mineral project or operation can be realized.

6. Why is This Task Important?

This initiative is aimed at developing clear, practical guidance on applying sustainability and sustainable development concepts at a project or operational level. Doing so is important for the following reasons:

Clarifying what Sustainability Means in Practice for Mining and Minerals

One result is a clarification of what sustainability and sustainable development mean in practice for the mining/minerals industry. These are concepts that now enjoy wide acceptance. However, they are values-based and when it comes to evaluating whether something is good, bad, better or best, different interests will come up with different answers. While these variations will continue, common ground is needed on identifying the basic questions or considerations that need to be included. With such a foundation as a starting point, processes can then be established for dealing fairly with the differences.

Establishing Consistency Across Applications

Potential applications of this work span the project or operation life-cycle and are listed in Box 2. Currently there is no consistency across these applications with the results being inefficiency, confusion and discord across different parts of the same company and between company and other interests. This effort is a step in establishing the needed consistency. The result will be a realization of significant efficiencies.

Clarifying the Case for Sustainability

This approach is a step in coming to terms with the economic, environmental, social and cultural benefits and costs of implementing the concept of sustainability. Over time, rigorous analysis and experience is slowly leading to quantification of many of these factors. Box 3 provides a summary of the overall case for sustainability that is now emerging. It lists the benefits sought by implementation of sustainability concepts and identifies for each line item, which of the seven questions are implicated.

In discussion of this table, some saw all of the factors in Box 3 combining to generate an overall "business case" for sustainability. While this may work for some, we have used Box 3 to offer a number of different perspectives, not only the business perspective.

Box 2. Potential Applications of the Seven Questions

Potential applications of the Seven Questions framework include:

a. ***Early appraisal:*** can/should a project or operation be acquired or implemented?

In early appraisal, the attractiveness and/or feasibility of any mining/minerals project or operation is first established. The framework serves as a checklist for assessing short- and long-term implications, even at this early stage.

Critically, it is at this point when land use planning and access criteria should be clearly established to ensure that expectations are not generated and funds are not wasted by subsequent rulings whose targets lie within "no-go" zones.

b. ***Planning:*** what do we do and whom do we involve?

By establishing the nature and breadth of considerations requiring attention, the framework serves as an overall guide for the planning process.

Box 2. Potential Applications of the Seven Questions (continued)

c. ***Financing and insuring:*** does the overall risk reflected in the project or operation lie within an acceptable range?

The framework provides a way into identifying the major categories of risk that require attention.

d. ***Licensing and approvals:*** does the project pass or fail?

Most current regulatory systems base their licensing and approvals processes on environmental and social impact assessments. However, a clear trend has now emerged to shift away from discipline-specific assessments to integrated sustainability assessments and much effort is going into considering the link between sustainability concerns and traditional impact assessments. In this application, the framework serves as a guide for an overall integrated sustainability assessment.

An approval process ultimately leads to an overall decision to go (with or without conditions) or not to go. Such decisions will rarely, if ever, depend on a single factor. In guiding such a process, the approach offered here consciously aims high to reflect an ideal target. However, failure to meet any one component or a set of components should not be considered a "show-stopper." The whole set requires consideration together and the "ideal answers" to the seven questions are not intended or designed to be a "scorecard" to grade a mining/mineral project or operation to render a decision to go or not to go. Rather, taking this approach is the only way to ensure that the thresholds and trade-offs that are ultimately applied in practice are seen in context.

e. ***Internal corporate reviews:*** how are we doing?; what's missing?; how do we do things better?

Any successful company is committed to continuous improvement. In this application, the framework provides a general guide for periodic internal reviews to:

- identify areas of vulnerability;
- identify opportunities for improvement; and
- bring consistency to various projects or operations that may be at different points in the life-cycle.

f. ***Corporate reporting:*** how do we communicate?

Communication within a company as well as external communication needs to be based on a consistent foundation. This framework offers such consistency.

g. ***External review:*** from the perspective of an external interest, how is the project or operation doing?

Lastly, the framework can serve as a guide for an assessment of an existing or proposed project/operation by interests such as a community, First Nation/Native American group, organized labour or non-government organization.

Box 3. The Case for Sustainability

Sought Outcome/Benefit *(relevant questions are identified in parentheses)*

a. The Business/Commercial Case

- improved relationships between the project or operation and all communities of interest (1)
- aligned expectations between the project or operation and other communities of interest (1–7)
- accelerated approvals process (1)
- avoidance of costly delays due to conflict (1–7)
- enhanced operational efficiencies (4)
- enhanced respect for company and industry (1–7)
- enhanced pride on the part of employees and shareholders (1–7)
- greater clarity and security in terms of land access (1, 6)
- improved access to equity and capital (1–7)
- stronger social licence to operate (1–7)
- improved overall company security and reduced risk (1–7)

b. The Environmental Case

- reduced environmental stress through all project life-cycle phases (3)
- greater and more effective effort put to maintaining/improving biophysical system integrity (3)
- enhanced ecosystem security and reduced risk

c. The Community Case

- reduced boom and bust syndrome (1–7)
- enhanced assurance that a desirable mix (as defined by the community) of traditional, non-market and market activities will be maintained (1, 2, 4, 5)
- enhanced assurance that adequate resources will be put to bridging to post-closure phase in a way that enhances community well-being (1–7)
- greater understanding and less suspicion of the operation/project; ongoing knowledge of site conditions (1)
- enhanced assurance that community will have the opportunity to participate in decisions that affect its future; greater confidence in the future as a result (1)
- greater confidence that those who carry the social and environmental risks will share in the benefits (1–7)
- enhanced education, health and social capital for current and future generations (1–7)
- improved community security and reduced risk (1–7)

Box 3. The Case for Sustainability *(continued)*

d. The Indigenous Peoples' Case (where applicable)

- reduced boom and bust syndrome (1–7)
- enhanced assurance that a desirable mix (as defined by the site-specific Native Americans or First Nations) of traditional, non-market and market activities will be maintained (1, 2, 4, 5)
- enhanced assurance that adequate resources will be put to bridging to post-closure in a way that enhances indigenous people's well-being (1–7)
- greater understanding and less suspicion of the operation/project; ongoing knowledge of site conditions (1)
- enhanced assurance that Native Americans or First Nations people will have the opportunity to participate in decisions that affect their future; greater confidence in the future as a result (1–7)
- greater confidence that those who carry the social and environmental risks will share in the benefits (1–7)
- enhanced education, health and social capital for current and future generations (1–7)
- improved security and reduced risk for indigenous people (1–7)

e. The Government Case

- improved confidence that a greater range of values (political constituents) have been factored into project-related decision-making processes (1–7)
- more efficient mix of regulatory, economic and voluntary incentives to achieve policy objectives (1, 6)
- improved relations between regulators, company and other communities of interest (1, 6)
- enhanced respect for government (1–7)

7. Issues in Bringing Theory to Practice

During the deliberations of the Task 2 Work Group, a number of issues were debated that were generally agreed upon in principle although the specifics of practical treatment were left unresolved. The list includes:

- ***The equity issue:*** effectively addressing the distribution of costs, benefits and risks among parties implicated by a mining/mineral project or operation;
- ***Trade-offs:*** how to best design and implement decision-making systems and approaches that effectively and fairly address trade-offs in any given site application;
- ***Need and alternatives:*** how to most effectively and fairly assess the need for a given project and/or commodity in light of considerations and alternatives that span local to global implications;
- ***Achieving a whole system perspective:*** seeing, understanding and factoring in a sense of the whole system, not just the small component parts;
- ***Uncertainty, precaution and adaptive management:*** dealing with uncertainty using an appropriate level of precaution and an adaptive management approach;
- ***The attribution problem and dealing with cumulative impacts:*** how to best address the common situation where a project is one of a number of contributors to social, cultural, economic and environmental change or stress—how to best establish the cumulative implications; how to best proportion responsibility; and who should take responsibility for the analysis;
- ***Integration, synthesis and language:*** how to engender a respect for the contribution of many disciplines and build a synthesis that draws on their many insights; how to address the challenge of finding a common language to facilitate such an approach.

These issues are not new. Many have grappled with them before and others will continue to work on them in the future as different approaches to their resolution are tried. Together, they are a testament to some of the complexities that must be faced in bringing the ideas of sustainability from theory to practice. In the paragraphs below, each is briefly discussed.

The Equity Issue: Addressing the Distribution of Costs, Benefits and Risks.

Addressing the fairness and equity of the distribution of costs, benefits and risks arising from an activity such as mining, is a central concern in all literature dealing with sustainability and sustainable development. Ensuring equitable and fair distribution is always included in sets of sustainability "principles."

There are several practical difficulties in achieving this ideal. First, the broad envelope of sustainability concerns includes environmental, economic, social and cultural attributes. The task of identifying and assessing the costs, benefits and risks associated with all of these is complex and society is early in the process of learning how to do so.

Second, current corporate, government and public interest culture, policy and even law, stand in the way of a comprehensive and openly transparent treatment of this issue.

Third, no one party (company, community or government) has access to all the pertinent data and information to undertake a full analysis. And while government is best placed to undertake this task, it has not been fully mandated to do so.

Finally, while relevant methods exist to contribute to such equity analyses, there is no broadly accepted approach.

This framework includes treatment of the distribution of costs, benefits and risks. Although it will take time to develop satisfactory ways of addressing the topic, it is not going to disappear. In the interim, this will likely continue to be a source of tension.

Addressing Trade-offs

"Sustainability" involves the maintenance of certain necessary or desired characteristics of human society and/or the ecosystem. However, deciding what is necessary or desired is a values-based process that will depend on who is deciding. In practice, trade-offs are made between interests, across ecosystem components, across space and across time.

Ideally, effective and fair treatment of trade-offs involves at least the following four steps:

1. articulation of the general principles that will guide the decision-making process;
2. development of the specific rules for governing the trade-offs in a given specific application;
3. design and implementation of a fair process for coming to terms with differences; and
4. determining who is/should be involved in making the trade-offs.

Addressing the above from beginning to end is beyond the scope of this initiative to date. However, it is a key aspect of effective implementation and remains to be addressed in follow-up work.

Need and Alternatives

If there is a fundamental question underneath all others, it is the question of whether society—or the world—"needs" any given project or operation. A significant debate has emerged regarding what would constitute a full needs assessment. The debate encompasses mining and minerals but also covers all other interventions in the natural environment as well—dams, irrigation projects, highways, pipelines and even urban expansion.

The question arises because of growing concern that current human activity is undermining the capacity of future generations to meet its needs. This concern is a central driver of the sustainability/sustainable development set of concepts and the issue is very simple: why do something that is undermining the capacity of future generations?

In market economies, governments accept the proponent's feasibility study along with their willingness to invest as a demonstration of need. If the proponent believes that a market exists for the product, need is established. For its part, the proponent will consider existing and projected demand and supply (as reflected in commodity price) and use that value to ascertain project/operation profitability. The assessment of financial feasibility and profitability is confidential and not open to public scrutiny in order to protect the competitive position of the proponent.

Over the last several decades, a broad sense has emerged that such market-driven decision-making may not always lead to satisfactory results in terms of the resulting human and ecological implications (the "ends" discussed previously in Section 4). However, such a sense begs some fundamental questions including: (1) how, in practice, should a needs assessment that improves on the current approach be undertaken?; (2) whose needs should drive the assessment?; and (3) who should be the judge? These are profound questions of public policy for which there are no simple or widely accepted answers.

Aspects of need—now and in the future—that come into play here include needs of:

- the local community;
- indigenous peoples where applicable;
- the land owner (surface and mineral estates);
- the project and company (including their need to maintain its mineral reserve base and production base), their employees, shareholders, investors and the supporting financial services industry;
- government agencies/institutions (local, state/provincial and national);
- the local, regional and national economy;
- national security;
- broader society that will consume the metals or minerals being mined or the products made from them; and
- the ecosystem.

Further complicating the needs debate is that today's need may differ from tomorrow's.

A variety of alternatives exist for addressing the above and different alternative courses of action will involve different trade-offs with different degrees of acceptability for various interests. These include some (for example, policy, regulatory and fiscal moves to encourage recycling to an extent that would displace needs for some mining operations) that are better addressed at an overarching strategic level than at the project level. However, there are many project-level alternatives to be considered including those related to access and transportation; project configuration; local infrastructure such as energy, water and sewage; flying in employees versus establishing permanent communities; various approaches to tailings and effluent management; and so on. One key alternative to be considered is that a project or operation not be implemented. Both the U.S. National Environmental Policy Act (NEPA) and the Canadian Environmental Assessment Act have a requirement for just such a no-action analysis so that all parties can gain an appreciation of projected conditions in the absence of a project. This is not to imply that the concepts of sustainable development support the "no-action alternative"; rather, the concept of evaluating the no action alternative provides a framework for evaluating a project or operation as it attempts to achieve sustainable development.

Seeing the Whole System While Respecting the Parts

Individual people, communities, human society in general and the activities in which we engage (including exploring, mining, milling, smelting, refining, metals manufacturing and recycling) are all nested in the enveloping ecosystem. People are inextricably part of the world's ecosystem; human and ecosystem well-being are interdependent.

Furthermore, from systems ideas comes the key observation that ultimately, what matters is the functioning of the overall system—something that is likely to be more than the sum of the parts. However, the whole system is exceedingly complex whereas the desired product for guiding a project assessment is something that is straightforward and transparent. As a result, there is a tension between the complex reality and the desire for practical implementation. The challenge is to make the approach simple enough for implementation while still being broad enough to be effective.

Uncertainty, Precaution and Adaptive Management

In dealing with the breadth of concerns raised by the sustainability envelope, there is much about which we can be certain. Ironically, it is often easier to know that we are

going in a wrong direction, than to be absolutely confident that we are going in a right direction. Regardless, there is even more about which there is great uncertainty. In practice, decisions must be made; the world isn't going to stop.

In principle then, the way forward should be guided by tenets such as adaptive management and the precautionary principle. Taking this or a comparable approach can facilitate a quick response as more knowledge is gained.

However, as good as this sounds, there is no set recipe available for exactly what this means in detail at any given site or with any given decision.

The Attribution Problem and Cumulative Impacts Assessment

From a mining/mineral operation perspective, there needs to be an accounting of the operation's contribution (positive and negative) distinct from those that result from other human activities in the same area or from independent ecological effects and events. This can be a difficult challenge because at a given site, many non-mining/mineral activities may be influencing social, cultural, economic and environmental conditions. In accounting jargon, this is called the "attribution" problem.

From quite a different perspective, ecosystem analysts have recognized the need to understand the whole system condition. They have come to understand that if a system happens to be close to a threshold, a small increase in stress can cause a catastrophic system collapse. This perspective has led to calls for, and development of, "cumulative impacts assessment" techniques as well as to greater emphasis on the precautionary principle. Thus, companies need to understand their part of the picture, but doing so necessitates an understanding of the larger, whole system.

Taking such a step pushes a company into subject material well beyond its area of expertise, direct control and responsibility. The dilemma can only be resolved with collaborative work on the part of the many interests involved. Currently, however, with the exception of community-based approaches for assessing progress toward sustainability, the needed mechanisms to do this do not exist.

Integration, Synthesis and Language

Many streams of knowledge have a contribution to make in bringing the ideas of sustainability from theory to practice: economics; ecology; systems theory; the health sciences; engineering and applied science; community planning; law; business management; performance measurement and progress assessment; and so on. Each of these can provide a doorway into the theory and application of sustainability ideas. However, the real power of applying the ideas of sustainability comes from a capacity to integrate and synthesize rather than split apart in bounded categories.

This point presents yet another challenge. Any result of this effort needs to use language that demonstrates a respect for these various streams of knowledge while providing an opportunity to gather insights, rather than creating barriers. Currently, different disciplines and interests operate with differences in their language. And, to confuse the situation further, those differences in language may or may not reflect differences in perspective. These differences result in a degree of tension that, in turn, leads to the need for incremental change strategies that evolve from back and forth interaction in which each participating party influences and is influenced by the others.

8. The Seven Questions in Detail

In this section, each question is discussed. A brief explanatory note is offered and a table is provided that lists an example hierarchy of question (goal), ideal answer, objectives, indicators and metrics. As mentioned earlier, the numbering and sequencing of the questions are provided as an aid to communication and do not imply priority. In any site-specific application, all questions should be applied as a whole set recognizing that the significance of each will likely vary.

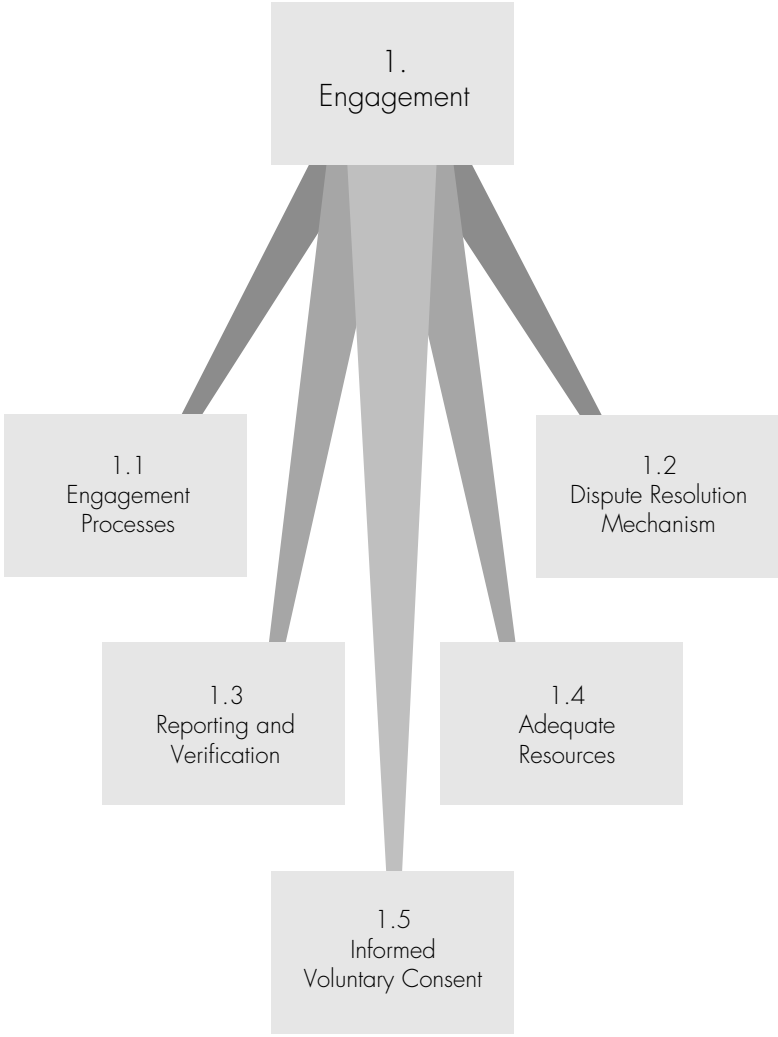
An attempt has been made here to organize the indicators in terms of inputs, outputs and outcomes. Each of these is important but is needed for a different reason as follows:

- ***"input" indicators*** are needed by managers and others for budgeting and priority-setting (examples: dollars allocated for an effluent treatment facility or drug treatment centre in the local community);
- ***"output" indictors*** are needed by managers and others to ensure that tasks assigned are completed and/or that commitments made are fulfilled (examples: effluent discharge chemistry or patients treated through the drug treatment centre); and
- ***"results" or "outcome" indicators*** are needed by managers and others to test the effectiveness of actions taken and the consistency of results with company, community or regional goals and objectives (examples: stream water quality or rates of drug abuse in the community).

The objectives, indicators and metrics that are included in Tables 1–7 should be considered examples that can be used as a starting point for developing the needed data and information base at any site-specific application. There is no intention to imply that all of these will be required in all applications. Rather, each application will require a subset of these (and/or others not listed here). Further refining these tables through a series of pilot tests is an important next step in development of this approach. In undertaking the pilots, any of the questions, answers, objectives, indicators and metrics may be modified, added to or eliminated.

In assessing and interpreting the data and information base, relevant international standards and conventions such as those addressing human rights, labour standards and water quality standards are assumed to provide a minimum starting point.

Figure 4. Example elements for assessing the success of engagement processes.



Question 1. Engagement

This question deals with the quality of relationships between interests implicated

by a mining/mineral project or operation. In the absence of healthy relationships, the potential for achieving a project that supports sustainability is greatly reduced. Example elements that could contribute to an assessment of the success of engagement processes are shown in Figure 4 and are described in greater detail in Table 1.

Box 4. The Benefits of Effective Engagement: Placer Dome's Wallaby Project, Granny Smith Mine, Western Australia

As part of development of the Wallaby Project, Granny Smith initiated a stakeholder consultation and participatory planning program. A consultation model developed for Wallaby allowed a dynamic interaction between Granny Smith's decision-makers, technical advisors and a broad cross section of stakeholders that included government and non-government organizations. The program involved the following four key steps:

- stakeholder identification;
- preparation of a briefing document;
- issue and impact identification workshops; and
- preparation of the environmental approval submission document with assistance from stakeholders.

The Wallaby Project was formally assessed as an expedited assessment in an eight-week period and approval was given by the Minister of Environment. As part of the commitment to sustainable practices, Granny Smith normally conducts, ongoing quarterly consultation meetings with stakeholders to discuss future development of the Wallaby Project. Two reports, *Granny Smith Sustainability Report 2000* and *A Case Study of the Wallaby Consultation Process* provide more detail on the sustainability aspects of this project and are available on the Placer Dome web site at http://www.placerdome.com under sustainability publications.

Table 1. Engagement: Are engagement processes in place and working effectively?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
*1. **Engagement.*** Are processes of engagement committed to, designed and implemented that: • ensure all affected communities of interest (including vulnerable or disadvantaged sub-populations by reason of for example, minority status, gender, ethnicity or poverty) have the opportunity to participate in the decisions that influence their own future; and • are understood, agreed upon by implicated communities of interest and consistent with the legal, institutional and cultural characteristics of the community and country where the project is located?	Satisfactory processes of engagement have been designed and implemented that: • ensure all affected communities of interest (including vulnerable or disadvantaged sub-populations by reason of for example, gender, ethnicity or poverty) have the opportunity to participate in the decisions that influence their own future; and • are understood, agreed upon and consistent with the legal, institutional and cultural characteristics of the community and country where the project is located. as indicated by:	Input – Output – Result	
	*1.1 **Engagement Processes.*** Engagement processes are in place for all phases of the project/operation life-cycle to serve as a mechanism for: • collaboratively identifying desired objectives, best approaches for gathering evidence in support of achieving objectives (quantitative and qualitative), assessment criteria and trade-offs and the bases for judging trade-offs; and • overseeing the application of the approach to assessing the contribution to sustainability articulated here.	• Comprehensive mapping of interests completed. • Design of engagement strategy completed including guidelines that are agreed upon by all interests. • Effective implementation as signalled by participant satisfaction.	• Yes/no. • Degree of satisfaction as signalled by periodic survey (responsibility shared by company, community and government).

Table 1. Engagement: Are engagement processes in place and working effectively?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	1.2 Dispute Resolution Mechanism. An agreed upon dispute resolution mechanism (or set) exists and is understood by and accessible to all communities of interest.	• Dispute resolution mechanism(s) exist(s). • Mechanisms work effectively as signalled by participant satisfaction.	• Yes/no. • Degree of satisfaction as signalled by periodic survey (responsibility shared by company, community and government).
	1.3 Reporting and Verification. Appropriate systems of reporting and verification are in place.	• Systems in place. • Systems working effectively from perspective of various interests.	• Yes/no. • Degree of satisfaction as signalled by periodic survey (responsibility shared by company, community and government).
	1.4 Adequate Resources. Adequate resources have been made available to ensure that all communities of interest can effectively participate as needed. NOTE: Responsibility for ensuring this capacity is in place rests with a mix of government, company and the local community itself. The exact distribution of this responsibility should be worked out collaboratively.	• Adequate resources available. • Satisfaction with level of support. • Effective participation achieved as assessed by company, community, indigenous peoples and government.	• Yes/no. • Degree of satisfaction as signalled by periodic survey (responsibility shared by company, community and government).

Table 1. Engagement: Are engagement processes in place and working effectively?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	1.5 Informed and Voluntary Consent. The informed and voluntary consent of those affected by the project or operation has been given. NOTE: Inclusion of this factor does not imply that consent be given as a requirement for a project to proceed. The responsibility for approval lies with the relevant regulatory agency that is mandated by the laws of the country. Rather, this factor is included as a means to assess the extent of concurrence of those affected by a project. If that concurrence is high, the potential for achieving a net positive contribution to sustainability is greatly enhanced. In contrast, if there is extensive negative feeling towards a project or operation, that potential is greatly reduced.	• Level of support by the local communities and those implicated in the project.	• Percentage of local community and those implicated supporting.

Question 2. People

This question addresses the implications of the project or operation to the well-being of people (employees and residents) and their communities. The required data and information base builds on traditional socio-economic impact assessment work as well as worker health and local and regional population heath studies. Example elements that could contribute to an assessment of human and community well-being are shown in Figure 5 and are described in greater detail in Table 2.

Figure 5. Example elements for assessing for human and community well-being.

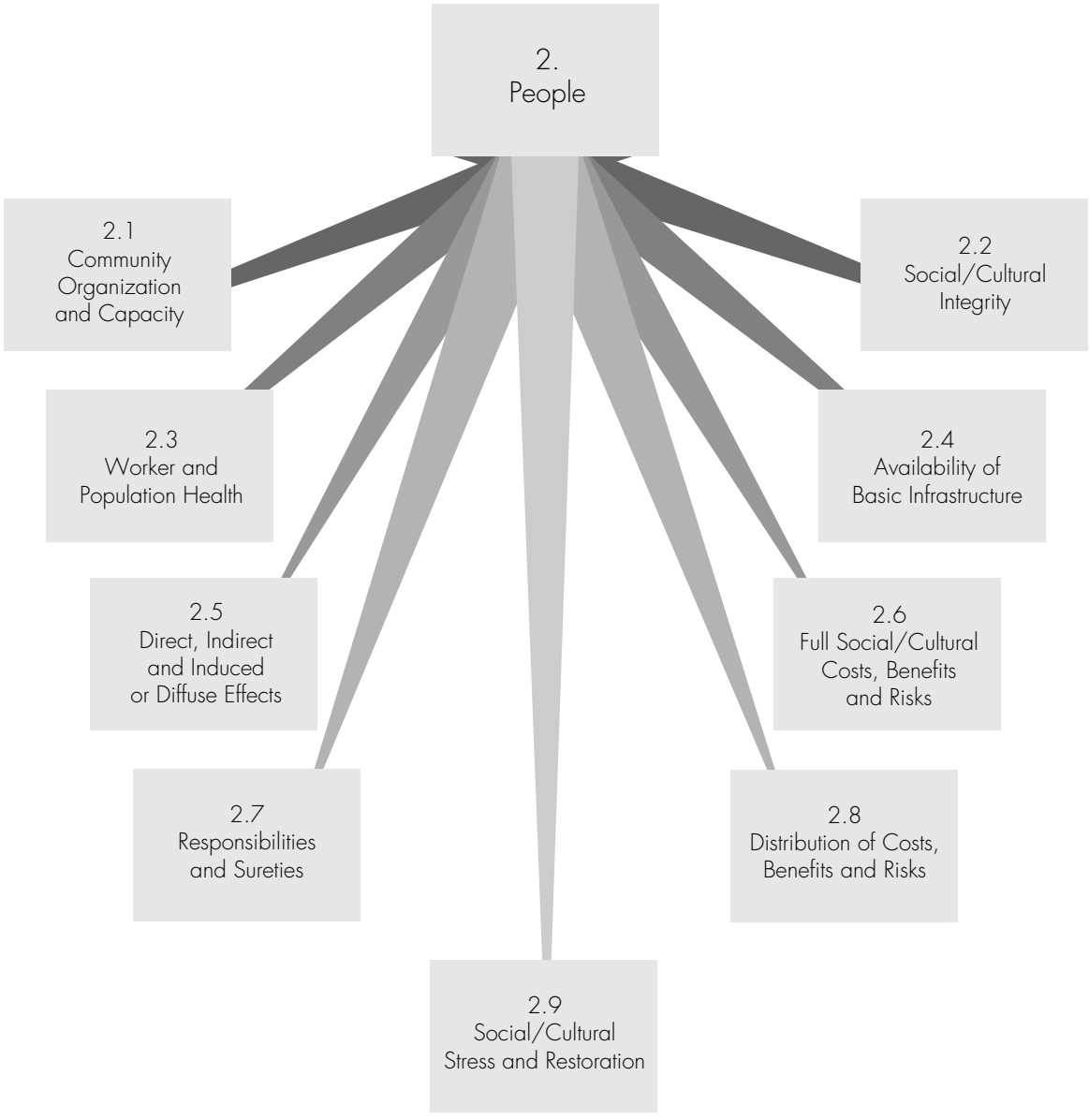


Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
*2. **People.*** Will the project/operation lead directly or indirectly to maintenance of people's well-being (preferably an improvement): • during the life of the project or operation? • in post-closure?	The project or operation will lead directly or indirectly to the maintenance or improvement of people's well-being: • during the life of the project or operation • in post-closure; as indicated by:	Input – Output – Result	
	*2.1 **Community Organization and Capacity.*** Effective and representative community organization and capacity (knowledge, skills and resources) are in place in the local community. NOTE: Responsibility for ensuring this capacity is in place rests with a mix of government, the company and the local community itself. The exact distribution of this responsibility should be worked out collaboratively.	• Presence of an organizational structure that links and represents the community in project-related decision-making processes.	• Yes/no. • Types of decision-making structure (e.g., pyramidal, collaborative) and process (e.g., devolved to leaders, consensus, collective, etc.).
		• Training facilities in place.	• Yes/no.
		• Local education/skills level is there to serve project needs and provide basis for post-closure activities.	• Yes/no.
		• The community has access to the expertise it needs to ensure that properly informed decisions are made.	• Yes/no.

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	2.2 Social/Cultural Integrity. A reasonable degree of confidence on the part of all communities of interest that social and cultural integrity will be maintained or preferably improved in a way that is consistent with the vision and aspirations of the community. (Note: this category is particularly dynamic and will change as a project proceeds.)	• Existence of community and regional visions expressed explicitly in development and land use plans. • Presence of key indicative social structures and their state. • Sense of satisfaction signalled by all interests that social and cultural integrity will be maintained or improved. • Social and cultural indicators identified as significant by the community.	• Consistency of project with community or regional plan. • Degree of satisfaction as signalled by periodic survey (responsibility shared by company, community and government).
	2.3 Worker and Population Health, Safety and Well-being. Maintenance or improvement of indicators of worker and population health, safety and well-being. NOTE: responsibility for gathering this data and information lies with a mix of company (in terms of workers), community and government. However, statistics on population health, training and education, jobs, income, poverty, debt, community resiliency and community dependency typically fall to government.	• Baseline studies completed that include basic demographics to track household incomes, population change (birth rate, infant mortality, morbidity rates, in/out migration), etc. • Worker health and safety.	• Yes/no. • Safety management systems in place including an "Occupational Health and Safety Committee"—jointly led by workers and management—and an effective accident investigation system. • Lost time injuries (frequency).

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
			• Medical aid injuries (frequency). • Fatalities (number). • Record of accident-free days. • Mine-related medical incidents (frequency).

		• Population health.	• Traditional health measures:
			  - life expectancy at birth;
			  - infant mortality rate; and
			  - rates of low birth weight.
			• Self-rated health status.
			• Unwanted teenage pregnancies (rate by age group).
			• Suicide rates.
			• Alcoholism and drug abuse.
			• Prostitution.
			• Family abuse.
			• Gangs.
			• Aboriginal health.
			• Incidence of mental illness.
			• Educational attainment, participation.
			• Labour force participation rates for men women, aboriginal peoples, vulnerable groups.

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
		• Training and education.	• Employment/ unemployment rates by industry.
		• Jobs, income, poverty, debt.	• Income and earnings of individuals and families.
			• Income inequity.
			• Poverty levels.
			• Debt: individual and families.
		• Crime and security.	• Crime incidence: overall, against persons, against property, against women.
			• Crime and aboriginal peoples.
			• Youth crime.
			• Risk of crime.
			• Fear and perceptions of crime.
		• Community resiliency	• Community resiliency index.
		• Community dependency	• Community dependency index.
	2.4 Availability of Basic Infrastructure. The infrastructure to meet basic needs is available to workers and residents.	• Water supply, sewage and waste water treatment, power, communications, transportation, education, health services.	• Age, type condition of infrastructure.
			• Proportion of population with access to various infrastructure.
			• Use rates.

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	*2.5 **Consideration of all Direct, Indirect, Induced or Diffuse Effects.*** A reasonable degree of confidence on the part of all communities of interest that all direct, indirect and induced or diffuse effects have been considered and addressed. NOTE: here too, requirements will change through the project.	• Direct, indirect and induced or diffuse economic, social and cultural effects of the project.	• Economic, social and cultural gains as agreed to by the community are achieved: - operation-related direct and indirect employment; - operation-related direct and indirect purchases from local suppliers; and - operation contributions to local activities: - cultural - health - educational - athletic - youth and elders - aboriginal • Satisfaction that all direct and indirect implications have been addressed.
		• Changes in social behaviour as a result of the project.	• Changed rates of alcoholism and drug abuse, prostitution, family abuse, unwanted pregnancies, suicide, gangs, etc.

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	2.6 Full Social/Cultural Costs, Benefits and Risks. A reasonable degree of confidence on the part of all communities of interest that the full costs, benefits and risks to people have been identified and factored into project or operation-related decision-making (as it applies throughout the full project or operation life-cycle).	• Satisfaction that all social/cultural costs, benefits and risks found across the full life-cycle from exploration through post-closure have been identified and addressed.	• Degree of satisfaction as signalled by periodic survey.
	2.7 Distribution of Costs, Benefits and Risks. A mechanism has been created and implemented for identifying, assessing and publicly reporting on the "equity" of the distribution of costs, benefits and risks from the perspective of various communities of interest including the company, indigenous peoples, community, government and broader society.	• Mechanisms to identify and assess distribution of costs, benefits and risks resulting from the project have been collaboratively designed and implemented involving company, community, indigenous people and government.	• Yes/no.
		• Assessment of distribution has been completed and communicated to all interests.	• Yes/no.
		• Satisfaction with distribution.	• Degree of satisfaction as indicated by survey of all interests.

Table 2. People: Will people's well-being be maintained or improved?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	2.8 Responsibilities and Sureties. A reasonable degree of certainty/confidence on the part of all communities of interest that the responsibilities and sureties for ensuring short- and long-term human well-being have been fully and fairly assigned and accepted (including responsibilities attached to company, community, government or non-government organization).	• A system is in place to address the consequences should company bankruptcy occur. • A system of bonds, sureties or other mechanisms for closure and post-closure is in place. • Satisfaction that mechanisms in place will provide adequate bridging for both the community and ecosystem from the operation phase through post-closure.	• Yes/no. • Yes/no. • Degree of satisfaction as indicated by survey of all interests.
	2.9 Cultural/Social Stress and Restoration. Various forms of stress imposed on individuals (workers and residents), their families and the community as a whole are within "acceptable" levels and actions to restore resulting upset are undertaken to an "acceptable" degree.	• Worker and population health status, see 2.3. • Special stress imposed during particular phases of activity such as construction (e.g., Effectiveness of company and community mechanisms for dealing with influx of workers during the construction phase).	• See metrics in 2.3. • Degree of satisfaction (as indicated by survey of interests) with how the influx of workers during the construction phase is managed (responsibility shared by company, workers, community and government).

Question 3. Environment

This question addresses ecosystem well-being in the region affected by the project with the realization that mining by its very nature (be it surface or underground) impacts and changes the earth. Thus, short-term impacts must be mitigated in the long-term. The focus of this section then is on the biophysical system including a consideration of landscape processes over the longer term. The data and information base builds on traditional environmental impact assessment, state-of-environment reporting and ISO 14000 management system reporting requirements. Example elements that could contribute to an assessment of ecosystem well-being are shown in Figure 6 and are described in greater detail in Table 3.

Figure 6. Example elements for assessing ecosystem well-being.

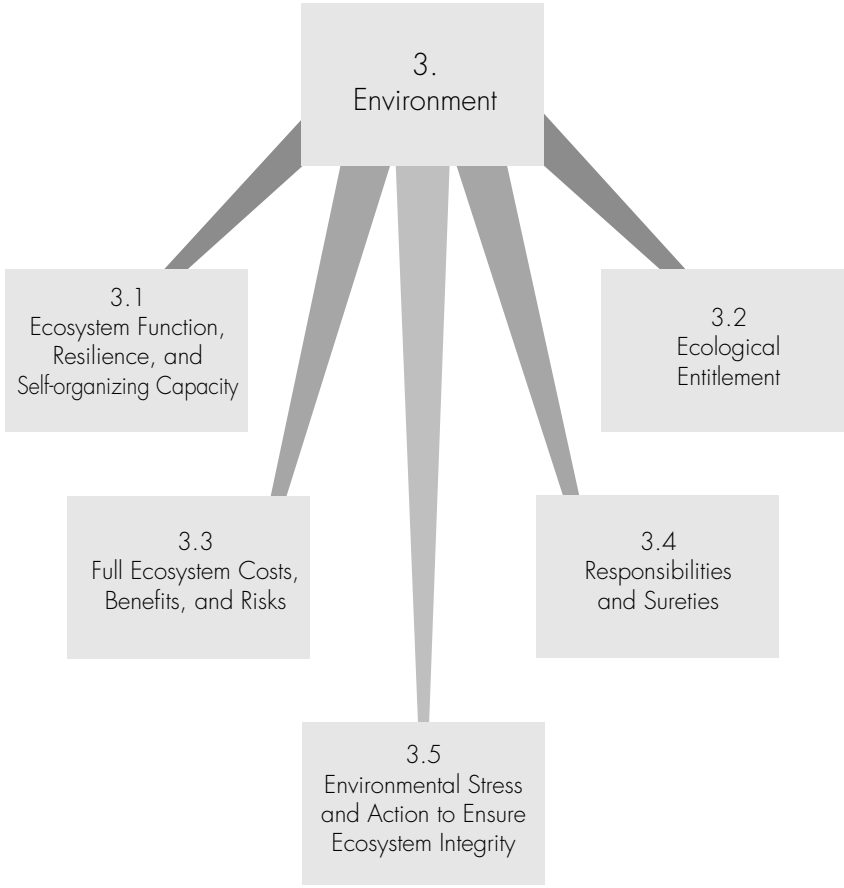


Table 3. Environment: Is the integrity of the environment assured over the long term?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
*3. **Environment.*** Will the project or operation lead directly or indirectly, to the maintenance or strengthening of the integrity of biophysical systems so that they can continue in post closure to provide the needed support for the well-being of people and other life forms?	The project or operation will lead directly or indirectly to the maintenance or strengthening of the integrity of biophysical systems as indicated by:	Input – Output – Result	NOTE: In the metrics below the term "grade" is used as a placeholder to suggest that some kind of assessment of the quality and adequacy of the work referred to should be undertaken.
	*3.1 **Ecosystem Function, Resilience and Self-organizing Capacity.*** A reasonable degree of confidence on the part of all communities of interest that ecosystem function, resilience and self-organizing capacity will be maintained or improved over the long term.	• Baseline studies completed. • Monitoring systems in place. • Projected effects of project on indicator species of aquatic and terrestrial flora and fauna (identified through scientific assessment as well as traditional ecological knowledge studies). • Projected long-term well-being of water systems and renewable resources in the area of the mining/mineral project. • Tracking rapid geological change.	• Yes/no/grade. • Yes/no/grade. • Population effects of project on indicator species. (e.g., Bathurst Caribou herd, northern Canada). • Various interests confident in projections as indicated by survey. • Fish, ungulate, small mammal and bird population health. • Health and abundance of medicinal plants used for traditional purposes.

Table 3. Environment: Is the integrity of the environment assured over the long term?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	3.2 Ecological Entitlement. A reasonable degree of confidence on the part of all communities of interest that the capacity of project-affected renewable and non-renewable resources will be maintained or improved such that the needs of current and future generations will be met.	• Degree of confidence.	• Confidence as indicated by survey of all interests.
	3.3 Full Ecosystem Costs, Benefits and Risks. A reasonable degree of confidence on the part of all communities of interest that the full costs, benefits and risks to the ecosystem have been identified and factored into project/operation-related decision-making (as it applies throughout the full project/operation life-cycle).	• Full or total costs accounting tools are used to assess the implications of the project. • Satisfaction that all social/cultural costs, benefits and risks related to the full life-cycle from exploration through to post-closure have been identified and addressed.	• Yes/no/grade. • Yes/no/grade by survey.
	3.4 Responsibilities and Sureties. A reasonable degree of confidence on the part of all communities of interest that the responsibilities and sureties for ensuring both short- and long-term ecosystem well-being have been fully and fairly assigned and accepted (including responsibilities attached to company, community, government or non-government organization).	• Financial sureties and mechanisms to address potential current and future environmental liabilities and effort required to ensure the continuing integrity of bio-physical systems. • Satisfaction that sureties and mechanisms will provide adequate bridging to post-closure state.	• Yes/no. • Degree of satisfaction as indicated by survey of all interests.

Table 3. Environment: Is the integrity of the environment assured over the long term?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	3.5 Environmental Stress and Action to Ensure Ecosystem Integrity. Physical, chemical and biological stress imposed on the ecosystem by the project or operation does not threaten the function, resilience and self-organizing capacity of the biophysical system; appropriate actions are taken to ensure the continuing integrity of biophysical systems.	Material Inputs/Flows • Water (surface, ground), energy (by form and source), reagents (e.g., cyanide), fuels, solvents, lubricants, other supplies.	• Amount used; unit of time or tonnes milled; unit of commodity produced.
		Recycling • Material recovery, oil, solvents, lubricants, batteries, tires, etc.	• Volume/proportion recycled.
		Waste • Hazardous and solid waste generated and discharged.	• Annual amount generated and discharged (kg/year).
		Surface Water • Effluent chemistry, ambient water quality downstream, stream sediment storage and load.	• Contaminant levels and toxicity.
		Groundwater Quality • Contaminant plume, plume chemistry, ambient quality downstream.	• Contaminant levels and toxicity. • Yes/no/severity.
		ARD and Metal Leaching • Tailings, waste rock, workings; short-term treatment required; long-term treatment required.	• Contaminant levels. • Propensity for.

Table 3. Environment: Is the integrity of the environment assured over the long term?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
		Soils • Chemical, biological and physical change, erosion.	• Propensity for.
		Rapid Landscape Change • Landslides and avalanches.	
		Air Quality • Emissions chemistry, indoor air quality, greenhouse gas emissions.	• Contaminant levels, dust emissions off site, annual emissions.
		Noise • Noise off site.	• Noise levels off site.
		Environmental Incidents • On site, off site.	• Number, rate, severity.
		Reclamation • On-site, off-site.	• Plans, completion, monitored.
		Environmental Effects Monitoring • System in place.	• Plans, completion, monitored.

Question 4. Economy

This question addresses the economic conditions of the company, any adjacent communities and the surrounding region. The required data and information base draws on traditional corporate economic, community and regional development approaches. Example elements that could contribute to an assessment of economic conditions are shown in Figure 7 and are described in greater detail in Table 4.

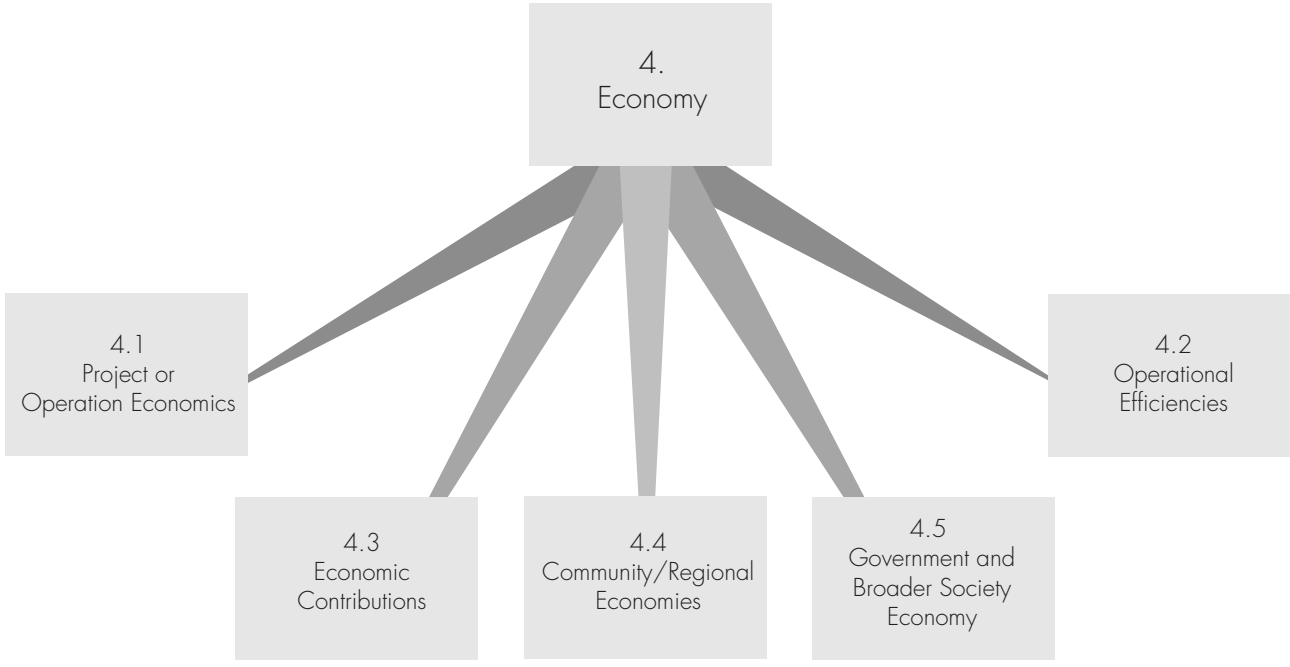


Figure 7. Example elements for assessing economic conditions.

Table 4. Economy: Is the economic viability of the project assured; will the community and broader economy be better off as a result?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
4. ***Economy.*** Is the financial health of the project/company assured and will the project or operation contribute (through planning, evaluations, decision-making and action) to the long-term viability of the local and regional economy in ways that will help ensure sufficiency for all and provide specific opportunities for the less advantaged?	The financial health of the project/company is assured and the project or operation will contribute (through planning, evaluations, decision-making and action) to the long-term viability of the local, regional and global economy as indicated by:	Input – Output – Result	

Table 4. Economy: Is the economic viability of the project assured; will the community and broader economy be better off as a result?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	4.1 Project or Operation Economics. Project or operation economic targets are achieved.	• Positive project economics are demonstrated as calculated in the feasibility study; as the project proceeds, economic targets are met.	• Operating earnings. • Net earnings. • Cash flow. • Commodity produced. • Return on Investment. • Research and development expenditures
	4.2 Operational Efficiencies.	• Mining efficiency. • Refining efficiency.	• Cash production cost. • Total production cost. • Percentage ore recovery vs. resources invested • Percentage recovery.
	4.3 Economic Contributions: annual/total.	• To the local economy. • To the regional economy. • To the national economy. • International. • Total.	• Dollars. • Dollars. • Dollars. • Dollars. • Dollars.

Table 4. Economy: Is the economic viability of the project assured; will the community and broader economy be better off as a result?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	4.4 Community/Regional Economies. Community and adjacent regional economic targets are met.	• Positive project economics are demonstrated as calculated in the feasibility study; as the project proceeds, economic targets are met.	• Accounting of benefits from the project and how those benefits are distributed.
		• Distribution of economic benefits resulting from the project.	• See 2.7.
	4.5 Government/Broader Society Economics. A net economic contribution to governments and broader society.	• Net financial gain for government; as the project proceeds, economic targets are met.	• Taxation and royalties in comparison to cost of government-provided services.

Question 5. Traditional and Non-market Activities

This question addresses the success of non-market human activities that are omitted from typical economic studies. For projects affecting indigenous people, a variety of traditional cultural activities come into play including hunting, gathering and other activities. In addition, the internal cultural and social structure of indigenous people is vulnerable to pressures that arise from mining activities.

Traditional and non-market activities are not restricted to indigenous communities. A large range of non-market activities is important in many non-indigenous communities. These activities might include hunting, bartering, volunteer activities, housework and many recreational and spiritual pursuits. Example elements that could contribute to an assessment of traditional and non-market activities are shown in Figure 8 and are described in greater detail in Table 5.

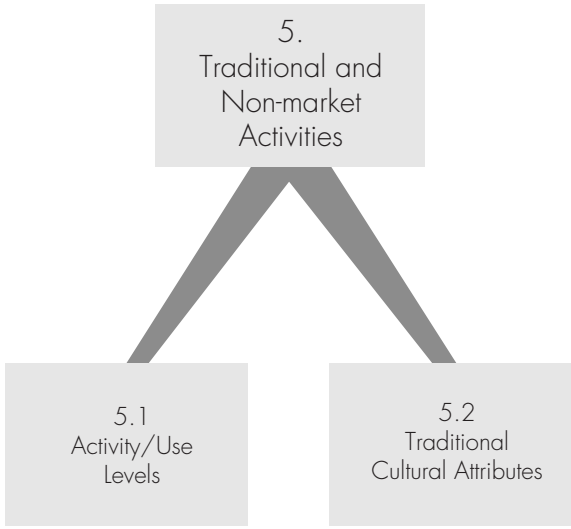


Figure 8. Example elements for assessing traditional and non-market activities.

Table 5. Traditional and Non-market Activities: Are traditional and non-market activities in the community and surrounding area accounted for in a way that is acceptable to the local people?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
5. Traditional and Non-market Activities. Will the project/operation contribute to the long-term viability of traditional and non-market activities in the implicated community and region?	The project/operation will contribute to the long-term viability of traditional and non-market activities in the implicated community and region as indicated by:	Input – Output – Result	
	5.1 Activity/Use Levels. Maintenance of activity/use levels as designated by the community in question.	• Baseline study of traditional and non-market activities completed. • Dependency levels on traditional and non-market activities.	• Yes/no. • Variations in participation in traditional and non-market activities as the project proceeds.
	5.2 Traditional Cultural Attributes. Maintenance of traditional cultural attributes as designated by the community in question.	• Use of indigenous language. • See also 2.1, 2.2 and 2.9.	

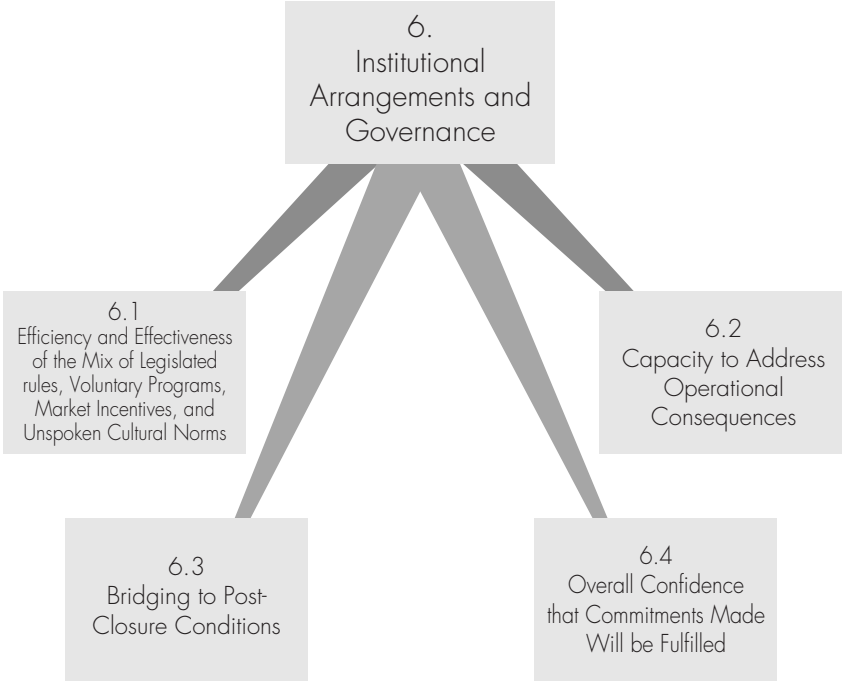


Figure 9. Example elements for assessing the effectiveness of institutional arrangements and governance.

Question 6. Institutional Arrangements and Governance

This question addresses the effectiveness of the formal and informal rules that society creates to govern activities like mining/mineral projects and operations. Example elements that could contribute to an assessment of the effectiveness of institutional arrangements and governance are shown in Figure 9 and are described in greater detail in Table 6.

Table 6. Institutional Arrangements and Governance: Are the rules, incentives, programs and capacities in place to address project or operational consequences?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
6. ***Institutional Arrangements and Governance.*** Are the institutional arrangements and systems of governance in place to provide a reasonable degree of confidence that the capacity to address project or operation consequences will continue to exist through the full life-cycle including post closure?	Satisfactory institutional arrangements and governance mechanisms are in place as indicated by:	Input – Output – Result	
	6.1 Mix of rules, market incentives, voluntary programs and cultural norms. An effective mix of legislated rules, market incentives, voluntary programs and cultural norms is in place for governing project activities.	• Satisfaction with mix from the perspective of the various communities of interest including company, community, indigenous peoples, non-government organizations and government.	• Survey results.
	6.2 Capacity. A reasonable degree of confidence is held by all communities of interest that the capacity to address project or operation consequences is in place now and will continue to exist throughout the full project/operation life-cycle including post-closure.	• Capacity of community support infrastructure to meet the needs of residents and workers of the region.	• Level and quality of services provided by federal, provincial/state and local government agencies designed to support the community (e.g., health, education and training, social support, etc.).
		• Monitoring and enforcement Programs are in place with adequate resources committed for the full project life-cycle.	• Level and quality of community support offered by project proponent, operator or government.

Table 6. Institutional Arrangements and Governance: Are the rules, incentives, programs and capacities in place to address project or operational consequences?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	6.3 Bridging. A reasonable degree of confidence is held by all communities of interest that an adequate level of resources will be accumulated and set aside throughout the life of the project/operation to ensure a smooth transition to an acceptable post-closure condition (ecological, social, cultural, economic) for the community that remains.	• Existence of community-based non-mining economic and social development initiatives.	• Presence and quality of community-based economic and social development and diversification plans.
	6.4 Confidence that Commitments Made Will be Fulfilled. A reasonable degree of confidence is held by all communities of interest that commitments that have been made will be fulfilled.	• Level of funding to cover rehabilitation/reclamation costs during operations and at closure.	• Funding set aside to cover costs of progressive reclamation activities during operation, closure and post-closure; as the project proceeds, successful maintenance (or preferably improvement) of the integrity of socio-biophysical systems is achieved.

Question 7. Overall Integrated Assessment and Continuous Learning

This question addresses the effectiveness of not only looking at the component parts of any assessment, but also standing back to consider the whole. Furthermore, it reflects a concern not only for a once-only snapshot, but also for a periodic re-assessment to ensure that trends over time are identified and factored into decision-making processes. Example elements that could contribute to an assessment of the effectiveness of an overall integrated evaluation and capacity for continuous learning and improvement are shown in Figure 10 and are described in greater detail in Table 7.

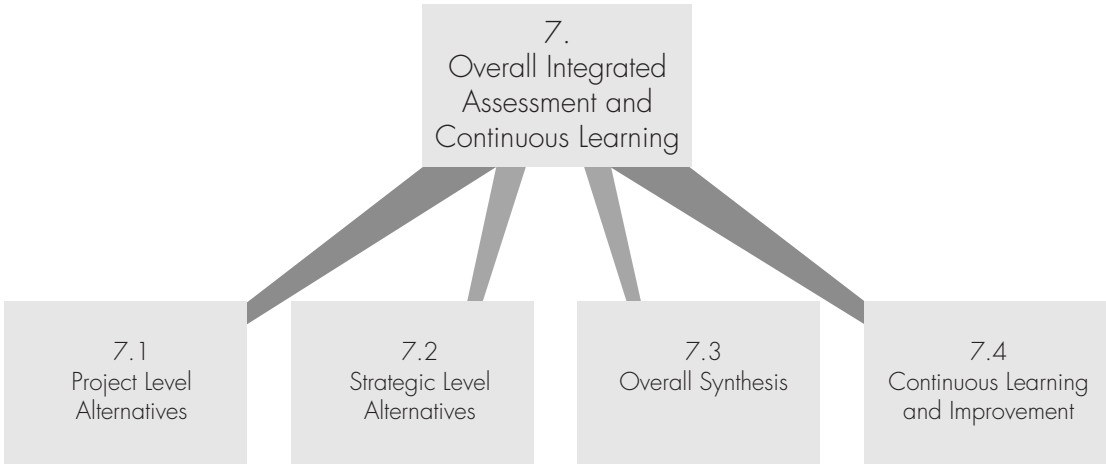


Figure 10. Example elements for assessing the effectiveness of an overall integrated assessment and capacity for continuous learning.

Table 7. Overall Integrated Assessment and Continuous Learning: Does a full synthesis show that the net result will be positive or negative; well there be periodic reassessments?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
7. ***Overall Integrated Assessment and Continuous Learning.*** Has an overall evaluation been made and is a system in place for periodic re-evaluation based on: • consideration of all reasonable alternative configurations and designs at the project level (including the no-go option in the initial evaluation); • consideration of all reasonable alternatives at the overarching strategic level for supplying the commodity and the services it provides for meeting society's needs; • a synthesis of all the factors raised in this list of questions, leading to an overall judgment that the contribution to people and ecosystems will be net positive over the long term?	An overall evaluation has been made and a system is in place for periodic re-evaluation based on consideration of: • consideration of all reasonable alternative configurations at the project level including the no-go option; • consideration of all reasonable alternatives at the overarching strategic level for supplying the commodity and the services it provides for meeting society's needs; and • a synthesis of all the factors raised in this list of questions, leading to an overall judgment that the contribution to people and ecosystems will be net positive over the long term; as indicated by:	Input – Output – Result	

Table 7. Overall Integrated Assessment and Continuous Learning: Does a full synthesis show that the net result will be positive or negative; well there be periodic reassessments?

Question (goal)	Ideal Answer (objectives)	Example Indicators	Example Metrics
	7.1 Project Level Alternatives. All reasonable project alternatives have been considered.	• All key alternatives have been considered, for example: - access - transportation - energy supply - water supply - local infrastructure - tailings and effluent management - mineral processing options	• Yes/no.
	7.2 Strategic Level Alternatives.	• A strategic level review has been undertaken that confirms project need.	• Yes/no.
	7.3 Overall Synthesis. A synthesis has been completed and the system is in place for periodic reassessment.	• Synthesis undertaken.	• Conclusion reached (or not) that the project's or operation's contribution to people and ecosystems is net positive over the long term.
	7.4 Continuous Learning and Improvement. A commitment to continuous learning and improvement is held by all interests including company, community, government and others.	• The mechanisms and resources are in place to periodically repeat the overall sustainability assessment and report the results publicly.	• Yes/no.

9. Next Steps: Pilot Testing and Ongoing Collaboration

The second objective of the Work Group was to suggest approaches or strategies for effective implementation. This topic was subject to only cursory review by the Work Group and sprinkled through Work Group deliberations were a number of observations about the need for implementation to include some form of "structured collaborative decision-making process."[1] The issue of implementation is a rich topic in and of itself and it remains as unfinished business for the Work Group.

For example, in any given application, the objectives, indicators and metrics may vary in their importance. Thus in any site situation, the weighting that is accorded any factor will vary according to site-specific conditions and the values of the participating interests. Due to the latter, the choice of who participates in an assessment (and the rules governing those choices) is critically important to the assessment outcome. In processes that are judicial or quasi-judicial in nature, rules exist governing who shall be accorded standing. However, for the less formal assessment processes that are generally the focus here, there is greater flexibility for involving all communities of interest as a means to further nourish the needed engagement process. These are all issues that need careful examination in the next phase of work.

However, rather than move to additional discussion of these kinds of implementation topics at this time, the following two sets of actions are recommended by the Work Group.

1. Pilot test the Seven Questions framework at a number of existing projects that span both developed and developing country examples of:

   1.1 an operation nearing the end of its production life;

   1.2 an operating primary metals manufacturing operation that includes a recycling capacity;

   1.3 an exploration project;

   1.4 a project at advanced feasibility that is seeking regulatory approval;

   1.5 a project in closure phase;

   1.6 a project in post-closure phase;

   1.7 a community-based assessment of an adjacent operating facility in mid-production life;

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1 There are a number of techniques for facilitating a systematic approach to multi-party decision-making where alternative values are at play. This is complex terrain that draws from decision-theory, but in practice, success is highly dependent on the interpersonal skills of participants. In the U.S., the Aurora Partnership was created several years ago to pool knowledge in this area and can be contacted through its web site at http://www.aurorapartnership.org.

One family of such approaches is grouped under the banner of multiple accounts analysis (MAA). MAA is a facilitated process aimed at systematically describing major issues of concern, weighing their significance and, when alternatives are to be considered, collectively coming to a preferred set of actions. While providing a basis for assessment, MAA is primarily a process (game plan with rules, guidelines and coaching) that provides for: (1) the exchange of information; and (2) expression and definition of concerns, interests and values. Properly applied, it is a transparent process in which all interests and values can be included, discussed and considered.

The key lesson for application of any "structured collaborative decision-making process" is maintenance of the process integrity through collaborative design of the ground rules and subsequent implementation involving all implicated communities of interest.

1.8 an indigenous peoples' -based assessment of an adjacent operating facility in mid-production life; and

1.9 a non-governmental organization based assessment of an operating facility of concern.

Pilots 1.1–1.6 should be lead by companies; pilot 1.7 by a mining-dependent community; pilot 1.8 by a First Nations/Native American community; and pilot 1.9 by a non-government organization.

2. Reconvene the Work Group following completion of five of these pilots to:

   2.1 review the lessons learned and appropriately modify the approach; and

   2.2 undertake a comprehensive review of the implementation issue.

In undertaking the pilot tests, it is inevitable that considerable effort will go into considering the nature and practicability of various objectives, indicators and metrics. This may lead to re-specification of some of the questions.

As more experience is gained based on experience, data and information from different projects in different parts of the world and at various stages in the project cycle, the Seven Questions approach will be refined and adjusted. In the continuing, iterative process that will unfold, the collaborative effort that has characterized efforts to date should be maintained. In this follow-up, the International Institute for Sustainable Development (IISD) has offered to continue in its role as Work Group facilitator.

Appendix – Foundation Background Documents

Sustainability and Environmental Assessment

1. Canadian Environmental Assessment Agency (CEAA), 1999. Voisey's Bay Mine and Mill Environmental Assessment Panel Report, Chapter 2, The Project and Sustainable Development. Ottawa: Canadian Environmental Assessment Agency

2. Gibson Robert *et al.*, 2001. Specification of sustainability-based environmental assessment decision criteria for determining "significance" in environmental assessment. Paper prepared under a contribution agreement with the Canadian Environmental Agency Research and Development Programme. Department of Environmental and Resource Studies, University of Waterloo and Research Affiliate, Sustainable Development Research Institute, University of British Columbia.

3. Hodge, R. Anthony, 2001. Sustainability and the Proposed Tulsequah Chief Project. Report prepared for the BC Environmental Assessment Office. Victoria: Anthony Hodge Consultants Inc.

Innu-Nation-Commissioned Work for the Voisey's Bay EA

4. Green, Thomas, L., 1998. Lasting Benefits from Beneath the Earth: Mining Nickel from Voisey's Bay in a Manner Compatible with the Requirements of Sustainable Development. Prepared for the Innu Nation.

Environmental-Mining-Council-of-B.C.-Commissioned Work for the Environmental Assessment of the Proposed Tulsequah Chief Project

5. Green, Thomas L., 2001. Mining and Sustainability: the case of the Tulsequah Chief Mine. Victoria: Environmental Mining Council of British Columbia.

International Investment Perspective

6. West, Gerald, T, and E I. Tarazona, 2001. Investment Insurance and Development Impact. Washington D.C.: Multilateral Investment Guarantee Agency (MIGA)/World Bank Group.

Corporate Perspective

7. Rio Tinto Borax, 2001. Borax and Sustainable Development.

8. Alcan (Kitimat, B.C.): Alcan in B.C. – Performance 1999

Government-led Multi-Interest Group Work on Indicators of Sustainable Mining

9. NRCan, 2000. A Consultation Paper on Canadian Values Underlying the Sustainable Development of Minerals and Metals. <http://www.nrcan.gc.ca/mms/>

10. US Sustainable Minerals Roundtable summary <http://www.mackay.unr.edu/smr/>

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_____ MacDonald, A. *Industry in Transition: A Profile of the North American Mining Sector* ($20 including taxes; add $5 for shipping and handling).

_____ MMSD Work Group 4. *Learning from the Future: Alternative Scenarios for the North American Mining and Minerals Industry* ($15 including taxes; add $5 for shipping and handling).

_____ MMSD Work Group 2. *Seven Questions to Sustainability brochure*. (Free!)

_____ MMSD Work Group 2. *Seven Questions to Sustainability: How to Assess the Contribution of Mining and Minerals Activities*. ($15 including taxes; add $5 for shipping and handling).

_____ MMSD–North America Final Report: *Towards Change.* ($15 including taxes; add $5 for shipping and handling)

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Mining, Minerals and Sustainable Development North America set out to develop practical principles, criteria and/or indicators that could be used to guide or test mining and minerals activities in terms of their compatibility with sustainable development. *Seven Questions to Sustainability: How to Assess the Contribution of Mining and Minerals Activities* offers the strategy and the template.

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