ENVIRONMENTAL IMPACT ASSESSMENT, IMPACT MITIGATION 
AND ENVIRONMENTAL PLANNING: 
IMPROVING THE LINKAGES IN MINING PROJECTS

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INTRODUCTION

The mining industry has played a significant role in the development of British Columbia since the mid-1800s, and even today, in a period of depressed mineral prices and markets, mining is the Province's second highest revenue earner after forestry. In 1985, the latest year for which complete statistics are available, thirty-six active mining projects produce mineral commodities valued at over CAN $2.14 billion. About 11,000 workers were employed at producing mines and a further 4,800 in exploration and development activities.

But the prosperity that the exploitation of its mineral resources has brought to British Columbia has not been without costs and problems. The characteristic "boom and bust" nature of mining operations can have profound effects on the stability of local communities, particularly those of First Nations. The increasing tendency of mining companies to request cost-sharing from government for infrastructure development raises questions of project viability and the security of public investment. Additionally, poorly-planned or inadequately managed mining operations can have severe, long-term impacts on the natural environment and public safety. Of particular concern are:

- the destruction of important fish and wildlife habitats;
- the erosion of spoil materials and the resultant contamination of streams and rivers;
- the escape of cyanide and other toxic reagents;
- acid mine drainage from high-sulphide waste materials; and
- catastrophic failures of waste rock and overburden dumps endangering watercourses and human safety.

In the late 1970's, after a number of unfortunate experiences with mining ventures, the British Columbia government initiated comprehensive review processes for all major mining proposals. These processes have required an assessment of the social, environmental, technical and economic impacts of a project and an evaluation of the options available for impact management. The processes lead ultimately to an explicit political decision on the acceptability of the project from a Provincial perspective. The object of this paper is to describe the Province's experiences in mine project assessment, the evolution of those processes over the past ten years, and some recent planning initiatives that have been undertaken by the Ministry of Environment and Parks to create a more effective environmental management context for the adjudication of mining proposals.
MEGA PROJECTS AND THE DEVELOPMENT OF THE FIRST ENVIRONMENTAL MINING LEGISLATION

For almost the first hundred years of the mining industry in British Columbia, mines were generally small by current standards and almost invariably underground. Communities were established, flourished and, with few exceptions, declined as ore reserves were exhausted. Sons followed fathers into the mines and the industry became the recruiting ground for generations of government regulators. In fact, the insular nature of the mining community ill-prepared it for the fundamental changes that were to occur, both in the structure of the industry and in public opinion, in the 1960s.

If time periods can be categorized, the ten years from 1960 to 1970 could be termed the decade of confrontation in resource management in British Columbia. In resource development sectors there were few established mechanisms for management integration and consultation, and fewer still that considered environmental and social values in development decisions. In frustration, staff of government conservation agencies often risked their jobs by "going public" in the news media to protect important environmental values. This tactic worked, however painfully, and politicians and industry began to become aware that conservation agencies were, in fact, mirroring a growing public concern for environmental quality.

A fundamental change occurred in 1968 with the storm of public controversy that greeted Kaiser Resources Ltd.'s announcement of plans to develop the province's first, large-scale surface coal mine. Out of this conflict originated the first provincial reclamation regulations, specifically; Section 8 of the Coal Mines Regulation Act (1969) and Section 11 of the Mines Regulation Act (1969). Initially, the legislation applied only to the surface mining of coal, metals, industrial minerals and construction aggregates but subsequent amendments included exploration (1971) and surface disturbances associated with underground mines (1972). In 1980, the two acts were combined, with their reclamation sections, into one Mines Act (1980). As a basic statement of policy, the reclamation legislation reads:

"It is the duty of every owner, agent or manager of a mine to institute and carry out a program for the protection and reclamation of the surface of the land and watercourses affected thereby, and on discontinuance or abandonment of a mine, to undertake and complete the program to leave the land and watercourses in a condition satisfactory to the Minister......"

The Act also provides for the following:

- submission of a report to the minister of Energy, Mines and Petroleum Resources containing a description of mining methods, a description of present and potential land use, and a reclamation program;
- the report serves as an application for a surface work permit authorizing the commencement of mining;
• review of the report by Ministers responsible for forestry, agriculture, Crown land management and environmental protection; and

The Kaiser project was quickly followed by two more surface coal mines in the same area, Fording Coal Ltd. (1972) and Byron Creek Collieries Ltd (1973). Throughout this first major coal expansion, the reclamation requirement and embryonic pollution control regulation provided the only vehicles for environmental regulation. No attempt was made to apply any degree of comprehensive environmental or social planning to development, and by 1975 it was apparent that some significant problems had occurred both in the natural environment and in local communities.

The human population of the coal field has increased almost three-fold in barely five years, exerting real pressure on housing availability, businesses, social services, and local government infrastructure. Responses to the development by all three local governments were uncoordinated, and all over-extended themselves, resulting in the near-bankruptcy of one. A new town was built in such a way that future expansion was highly constrained, though it was known at the time that it might have to service two additional projects, and its commercial area was situated on lands subject to flooding.

The three mines experienced six major overburden dump failures, two of which resulted in loss of life, and both air quality and water quality were being degraded. The habitat of provincially, and in some cases nationally, significant fish and wildlife populations was being disturbed at the same time that recreational demand for these resources was increasing rapidly.

It became apparent that the uncoordinated application of a number of individual statutes and regulations would not ensure the orderly development of major mining projects, and the companies themselves were simply bewildered by what they perceived as an overly-complex, bureaucratic maze. It also became apparent that reclamation by itself could not address all of the environmental concerns related to a mining project. The major shortcomings in this regard were:

• since reclamation is a means of restoring resource values over time on disturbed lands, it cannot mitigate the impacts or loss of productivity that occur during mining;
• reclamation for some uses such as ungulate winter range, is probably impossible with present technology because of the lack of suitable native plant material for reclamation; and
• the purpose of the interagency review of reclamation reports was to provide advice to the Chief Inspector of Mines who, since he was also an advocate for mineral development, frequently ignored the advice.
THE FIRST MINE DEVELOPMENT GUIDELINES

In 1969, after a decade of growing conflict and acrimony between the three levels of government, provincial resource agencies, development proponents and the public, in such areas as overlapping jurisdictions and differing development visions, expectations and values, the B.C. Cabinet created an informal group of five Ministers, the Land Use Committee (LUC), to promote resource management integration. The duties of the LUC became so important over the next two years that in 1971 the process was formalized with the passage of the Environment and Land Use Act and the creation of a formal Cabinet group, the Environment and Land Use Committee (ELUC). The Act provides very broad powers to ELUC to intervene in resource and land use matters. The next year a provincial election was held and the government changed. The new government decided that the ELUC was in need of regularized technical support staff and a small unit called the ELUC Secretariat was formed. By 1975, the obvious inability of existing processes to deal adequately with the environmental and social aspects of mine development, and the possibility of seven new coal mines in the province by the end of the decade, prompted the ELUC to have a full review of the coal industry prepared by a multi-party task force. The task force report, entitled Coal in British Columbia: A Technical Appraisal (1975), recommended that a set of interdisciplinary guidelines for coal development be prepared. The object of these guidelines would be to ensure that an integrated review and planning process would occur prior to decisions on each mine development. In addition to considering the minesite itself, the guidelines would also cover:

- the environmental impacts of offsite components, such as road, rail and power transmission infrastructure;
- the social and economic implications of development to existing urban and rural communities; and
- a benefit/cost analysis of the project as a whole from the provincial perspective, if public funds were required for infrastructure development or serious impacts that could not be mitigated were predicted to occur.

The Guidelines for Coal Development were completed, approved and implemented in March 1976. They were to be administered by a committee chaired by the ELUC Secretariat, with representatives from the ministries responsible for mines, environment, municipal affairs, transportation, economic development and labour. In 1979, the Ministry of Energy, Mines and Petroleum Resources developed a similar process for application to metal mines. This process was administered by a committee chaired by MEMPR, with a secretary from the ELUC Secretariat, and with members from the Ministries responsible for environment, municipal affairs, economic development and transportation.

The two processes were similar in intent and shared the following characteristics:

- non-legislated, working policy;
- applied to all new mines from the end of exploration to permitting and start-up;
applied to major expansions or modifications of existing mines;
intent to provide a "one-window" contact for mine developers in dealing with government.

The structures of the two processes were also similar, with two minor exceptions, as shown in Figure 1. Each was essentially a linear process in which the project proceeded through a series of stages to a point where an approval-in-principal decision was given by the ELUC, after which the permits and licenses needed to implement the project could be issued. The main differences between the two processes were the requirement for a prospectus as the entrance to the coal guidelines, and the existence of a "fast track" in the metal guidelines whereby a small project could avoid the requirement for a Stage II report.

In retrospect, the two processes worked tolerably well for complex projects. Both industry and government agencies expressed support for the process during government deregulation initiatives in 1982-83, and the process began to have real meaning for buyers and financial institutions since sales contracts and financing were usually contingent on approval-in-principal. By 1983, the record of the two processes was as shown in Table 1.

**TABLE 1. RECORD OF THE COAL AND METAL MINE REVIEW PROCESSES**

<table>
<thead>
<tr>
<th>Process</th>
<th>Years</th>
<th>No. of projects</th>
<th>Approved</th>
<th>Dormant/ in review</th>
<th>Constructed</th>
<th>Capital Invest. billion $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>76-83</td>
<td>25</td>
<td>11</td>
<td>14</td>
<td>6</td>
<td>3.2</td>
</tr>
<tr>
<td>Metal</td>
<td>79-83</td>
<td>24</td>
<td>21</td>
<td>3</td>
<td>8</td>
<td>1.1</td>
</tr>
</tbody>
</table>

By 1982, however, it was apparent that changes had to be effected to the processes to make them function more efficiently. If any statement can be said to capture the intent of a development review process, it is probably the following from the report of the coal development task force:

"Environmental impact assessment should not be perceived as a set of narrowly-based studies of the impacts of coal development on the natural and social environments, prepared late in the engineering feasibility study process. Rather it should be thought of a planning tool that shapes the whole development program from its inception to be responsive to the economic, social and environmental goals of the region of development. In some cases, environmental and social costs may outweigh the economic gains and the development will not proceed. Where a project does contribute positively to the overall social well-being of a region, the assessment process should tailor the development to fit smoothly into the regional planning goals of the area."

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- **Prospectus**
  - Coal Mines Only
  - Conceptual description of project.

- **Stage I Report**
  - Initial project design.
  - Predict impacts.
  - Review existing information.
  - Collect new information.

- **Stage II Report**
  - Detailed project design.
  - Quantify impacts.
  - Detailed programmes for impact management.

- **Stage III**
  - Permits & Licences (reclamation, water waste management)

- **Project Implementation**
  - Construction & operation.
  - Environmental surveillance, supervision, monitoring and adjustment.
Over the first six years of trial and evolution, this original vision of the review process had been partially lost. Some aspects of the guidelines had become cumbersome, required clarification or were simply outdated. In particular, there were four generic problems.

1. The review of the stage I report was the first point at which any guidance was provided to the proponent. Even in the coal guidelines where a prospectus was required, it was treated as an information document only. The guidelines contained comprehensive "checklists" of potential issues and information requirements, but little direction on how real issues could be identified for a specific project and information needs scoped. As a consequence the Stage I report often contained much irrelevant information and had little management focus.

2. The process forced the proponent into an artificial pre-feasibility (Stage I)/feasibility (Stage II) reporting structure that was unrealistic given the manner in which most mines develop. The result was that some projects changed so fundamentally in concept between stages that substantial back-tracking was required in the review.

3. The approval-in-principle decision came too late in the process. It was unfair and unrealistic to expect a company to invest several years and considerable expense in the process before receiving any signal at all from government on the acceptability of its project. An added complication was the, seemingly inadvertent, removal of ministerial discretion in the granting of coal production leases, during a legislative rewrite in 1979. This raised the possibility of substantial compensation payments in the event of a rejection-in-principle by ELUC.

4. The processes were too rigid to deal effectively with the full range of projects encountered, which might vary from an underground metal mine employing 60 workers and disturbing 50 ha to a surface coal mine employing 1500 workers and disturbing 2500 ha. Even in the metal mines process where a "fast-track" existed, there were no explicit criteria for its use and it was never entirely transparent why one project was "fast-tracked" and another not.

With these problems in mind, and after consultations with the mining industry and public groups, the two steering committees approached the ELUC in 1983 with a recommendation to undertake a full review of the process. In particular, the review would look to accomplish the following improvements:

- to combine the two processes into one that could be consistently and equitably applied to all mining projects;
- to introduce more flexibility to the process to allow for full review of complex projects and an expedited "fast-track" for simple projects with few impacts;
- to schedule the approval-in-principle decision as early as possible in the process to avoid waste and uncertainty; and
- to place the assessment of environmental and social impacts in a management context.
The ELUC agreed with the need for revision and appointed a single steering committee to undertake the review in consultation with other agencies of government, the public and the mining industry. The steering committee was chaired by the Ministry of Energy Mines and Petroleum Resources and comprised representatives from ministries responsible for environment, municipal affairs, transportation and economic development.

THE NEW MINE DEVELOPMENT REVIEW PROCESS

The steering committee reported back to the ELUC in mid-1984. It proposed four major goals for the new Mine Development Review Process (MDRP).

1. To facilitate and expedite sound, publicly acceptable mining ventures in British Columbia.

2. To ensure effective coordination and realistic staging of company/government contacts.

3. To ensure early identification and management of environmental, financial and community impacts.

4. To ensure consistent application of government policies and regulations.

The major characteristics of the MDRP were more precisely defined as:

- non-legislated, working policy (though backed by the ELU Act);
- applies to mining of coal and hard-rock minerals, new mines, major expansions or modifications of existing mines, and samples, trial cargos and test shipments over 5000 tonnes;
- does not apply to exploration, placer mines, gravel pits and test samples under 5000 tonnes, all of which will continue to be regulated by the Mines Act; and
- coordinated by an interagency steering committee called the Mine Development Steering Committee (MDSC), providing one major contact point between the mining proponent and government.

The process would consist of four components - project design, social impact assessment and mitigation, environmental impact assessment and mitigation and economic analysis, as shown in Table 2. The environmental component has four major objectives as outlined in Table 3.
TABLE 2. COMPONENTS OF MINE PROJECT ANALYSIS

### PROJECT DESIGN

- To ensure a technically and economically effective mine design with respect to employee safety, optimum resource recovery, and environmental protection.

### SOCIAL IMPACT ASSESSMENT AND MANAGEMENT

- To assess and mitigate impacts on local residents, services (schools, health facilities, police, court services, etc.), regional infrastructure (housing and accommodation, road, rail, sewer, water, etc.), and to determine the project's requirements for staff and training.

### ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

- To assess and mitigate impacts on water supply, water quality, air quality, fish, wildlife, vegetation, soils, heritage resources, and the users of those resources.

### ECONOMIC ANALYSIS

- To determine whether the project is of sufficient economic viability and benefit to afford the costs of impact management, to repay government contributions to infrastructure development, and to offset those resource losses that cannot be avoided or mitigated.
TABLE 3. ENVIRONMENTAL OBJECTIVES OF MINE PROJECT ANALYSIS

- To assess the impacts of the development on those resources not protected by strong legislation (wildlife and fish habitat, vegetation, soils, aesthetics, archaeological sites) and to develop adequate protection and mitigation strategies.

- To guide the proponent towards the information required in support of the various permits and licenses needed to mine (i.e. waste management permits, water licenses and reclamation permits).

- To ensure that the environmental impact assessment and mitigation programs are integrated to the greatest extent possible with mine design, construction and operation.

- To provide elected representatives with information on both the costs and benefits of the project so that a reasoned decision on approval or rejection can be made.
In order to accommodate the additional flexibility seen to be necessary the structure of the review process was significantly changed. Figure 2 shows the structure ultimately approved by the ELUC. The five most important changes are:

1. A prospectus is now required of all projects and serves as the entrance into the process. It is used to scope the management issues, screen the project to an appropriate review path, and focus the subsequent data collection and analysis.

2. Review of each staged report serves as a basis for the development of project-specific, "tailor-made" terms-of-reference for the next submission.

3. Two "fast-tracks" have been introduced, one allowing the project to go from Prospectus directly to permits and licenses, and the other avoiding the requirement for a Stage II report. In each case the explicit decision in using the "fast-track" is that there are no outstanding issues associated with the project that cannot be resolved through routine permitting and licensing procedures.

4. The approval-in-principle decision is now made on the basis of the Stage I report. That decision can be rejection of the project, approval of the project, or deferment of the decision. An approval-in-principle means that all anticipated impacts of a project have been identified, and that effective and affordable means of managing those impacts have been proposed and committed to by the proponent. The deferment option can be exercised if the Stage I report is deficient in important respects or if the project is simply too complex to be dealt with in a single submission. In the latter case, proponents will usually be told at the time of Prospectus review that an approval solely on the basis of a Stage I report is unlikely.

5. The use of Stage II is now the exception rather than the rule. It can be used after approval-in-principle to provide more detail on impact management programs, or it can be used after the deferment decision to provide better definition of impacts and more concrete proposals for mitigation. The difference is that in the first situation, the Stage II is clearly a "how to" report, while in the latter situation, the consideration is still "whether to".

Two further aspects of the Mine Development Review Process were clarified in the 1983 review - Government of Canada involvement and public consultation. The Federal Government has responsibility for the management of commercial migratory salmon, exercises controls over activities affecting water flows and quality in trans-boundary rivers, and has fiduciary responsibilities to First Nations. Though the Federal Government has its own Environmental Review Process, it has agreed to use the Mine Development Review Process as long as its needs are satisfied. Public information and consultation is the responsibility of the review process. All Company submissions, except those containing internal project economics, become public documents as soon as they are accepted for review, and the Company is required file copies with the Government Agent and to place copies in local government offices and public libraries in the project's area of influence. All government review comments are also made public.

- Conceptual design.
- Collect new information.
- Final design.
- Quantification of impacts.
- Mitigation proposals.

- Detailed programmes for impact management.
- Permits & Licences
- Construction and operation.
- Surveillance, supervision, monitoring and adjustment.

* POSSIBLE POINTS FOR PUBLIC HEARINGS
and are likewise distributed throughout the local community. The proponent is required
to hold public information meetings and report on the results of those meetings before the
ELUC considers approval-in-principle. For very controversial projects, or where the
Steering Committee is not confident about the proponent's ability to conduct constructive
public meetings, the steering committee can choose to hold informal meetings itself in
affected communities. On complex projects where significant public concern is apparent,
the ELUC can opt for a formal public hearing, though only one such hearing has been
held in the history of the review process. Hearings may be scheduled either before or
after the approval-in-principle decision. In the latter case, the hearing would normally be
tied to one of the regulatory permitting procedures.

STRATEGIC ENVIRONMENTAL PLANNING: A Context for Conflict Resolution and
Impact Mitigation

However efficient the new Mine Development Review Process, it has one major
shortcoming common to most environmental impact assessment processes; e.g. each
project tends to be considered as a separate entity, in relative isolation of any broader
context. Thus, it is often difficult to assess the regional or provincial importance of
environmental or natural resources that may be placed at risk by a proposed mining
project, and to determine the implications of trade-off decisions. Even when major
resource trade-off decisions are not involved, the narrow scope of the review process can
result in the following problems in developing mitigation programs.

1. Where impacts have been identified and quantified the need for, and the appropriate
level of, mitigation activities is not always apparent. Questions like "How many
animals are enough? and "What level of ambient water quality is sufficient?", have
plagued the environmental manager because they can be answered only in a regional
context.

2. When the focus is a mine site, it is often difficult to identify off-site opportunities for
impact management, which may be more cost-effective than those in the immediate
vicinity of the mine site. For example, the benefits of enhancing an undisturbed
wildlife habitat to improve its carrying capacity may be greater and considerably
more cost-effective than attempts to recreate the habitat through reclamation.

3. It's not possible, through a project review process that focuses on single projects, to
deal with the cumulative impacts of a number of developments on an area, and to
coordinate the necessary environmental management activities of government with
the mitigation responsibilities of individual project proponents.

A number of initiatives are presently underway in British Columbia to provide a
management environment in which the Mine Development Review Process and other
operational sectoral planning processes can function more efficiently. One of these is the
strategic environmental planning program of the Ministry of Environment and Parks.
The Ministry of Environment was created between 1978 and 1980 in a major government organization. It consisted initially of six resource management or regulatory programs and three service programs. In a smaller reorganization in 1986 the Provincial Parks Program was added to the Ministry, though in practice the operations of the Parks and Environmental Management Divisions remain separate. The mandate and responsibilities of the Environmental Management Division are summarized in Table 4.

Early in the organizational process, the new Ministry Executive noted the lack of any quantified management objectives for the resource programs, and of any formal planning process to establish such objectives, set priorities and integrate the activities of the Ministry. Thus there existed no explicit context for licensing and regulatory activities, for negotiations with development proponents and other development agencies of government, or for the trade-offs that might have to be made between environmental and other resource and development values.

In 1981 the Ministry established a Planning Branch (now the Planning and Assessment Branch) with the mandate to develop a resource planning system, and to assist management and regulatory staff in their planning activities. The Branch's major responsibilities are plans at the strategic or policy level and plans that integrate across two or more Ministry programs. The planning system adopted by the ministry is shown in Table 5. The system should not be considered a rigid hierarchy, but rather a range of planning services from which management staff can select those levels that are most appropriate to their program's present needs. All levels of planning - from the Ministry Plan to individual operational plans - contribute to the development of the Ministry's annual and 5-year budget projections.

The planning level most pertinent to the discussion of environmental impacts and mitigation is the level designated "sub-regional integrated". These plans are based on fairly large geographical areas (major river basins or airsheds), and have a number of important characteristics:

- these are resource management plans linking program policy at the provincial and regional levels with operational planning;
- they determine the range of possible management options, based on an analysis of present and projected use, and present and potential "supply" of resources;
- from the array of possible options, these plans establish measurable resource management objectives, and set out the management strategies and activities necessary to accomplish them; and
- they identify the linkages and interactions between the various resource programs and operational activities of the Ministry.

The two most important components of the sub-regional planning process are (2) and (3) above, in which management options, objectives and strategies are determined from an analysis of resource supply and use. The nature of the supply/use analysis is shown in Table 6 for three selected Ministry programs - wildlife, water allocation and water quality. These examples illustrate two of the major elements of the analysis:
TABLE 4. THE ENVIRONMENTAL MANAGEMENT DIVISION, B.C.
MEVISTRYOF ENVIRONMENT AND PARKS.

- Established in 1978

- Mandate established by 8 major and 11 minor statutes

- Resource Management Responsibilities
  - Water (allocation)
  - Water quality
  - Air quality
  - Sport fish
  - Wildlife

- Regulatory Responsibilities
  - Water licensing (allocation of use)
  - Waste permitting (discharges to water and emissions to air)
  - Water approvals for industrial facilities in water courses (bridges, culverts, etc.)
  - Recreational fishing and hunting licenses
  - Pesticide application licenses
  - Broad regulatory powers on designated Environmental Management Areas

- Service Responsibilities
  - Topographic and Resource Mapping Services
  - Designation of flood hazard lands and development of flood control/proofing programs in cooperation with local governments
### TABLE 5. LEVELS OF ENVIRONMENTAL PLANNING.

<table>
<thead>
<tr>
<th>Planning Level</th>
<th>Planning Unit</th>
<th>Planning Scale</th>
<th>Plan Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry</td>
<td>Province</td>
<td>&lt; 1:2,000,000</td>
<td>Broad policy plan establishing long-term ministry goals, mechanisms for integration between programs, and 5-year ministry priorities.</td>
</tr>
<tr>
<td>Provincial Program</td>
<td>Province</td>
<td>&lt; 1:2,000,000</td>
<td>Broad policy plans establishing long-term goals and management priorities for each ministry program.</td>
</tr>
<tr>
<td>Regional Program</td>
<td>Resource Region</td>
<td>1:500,000</td>
<td>Detailed policy plans establishing management objectives and strategies for a stated planning horizon for individual ministry programs.</td>
</tr>
<tr>
<td>Sub-regional Integrated</td>
<td>River Basin Air Shed</td>
<td>1:250,000 to 1:100,000</td>
<td>Integrated environmental management plans establishing quantified management objectives for a stated planning horizon based on an analysis of both use and supply of environmental resources. Management programs for a 3 to 5 year period are prepared to accomplish the objectives.</td>
</tr>
<tr>
<td>Operational</td>
<td>Specific areas or functions</td>
<td>1:50,000 to 1:10,000</td>
<td>Short-term, intensive action plans specified by the management prescriptions in higher-level plans. May be integrative or program-specific.</td>
</tr>
</tbody>
</table>
TABLE 6. ELEMENTS OF SUPPLY/USE FOR SELECTED RESOURCES.

<table>
<thead>
<tr>
<th>Factors of Supply</th>
<th>Factors of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) WILDLIFE</td>
<td></td>
</tr>
<tr>
<td>• Population (numbers, structure, trends and sources of mortality).</td>
<td>• Consumptive recreational use.</td>
</tr>
<tr>
<td>• Habitat (capability, present condition, land tenure, present and future land use).</td>
<td>• Non-consumptive recreational use.</td>
</tr>
<tr>
<td>• Opportunities for population and habitat enhancement.</td>
<td>• Ethical considerations (biodiversity conservation).</td>
</tr>
<tr>
<td></td>
<td>• Commercial use (guiding and trapping).</td>
</tr>
<tr>
<td>(b) WATER QUALITY</td>
<td></td>
</tr>
<tr>
<td>• Present quality and ecological status.</td>
<td>• Present important water uses (consumptive and in-stream).</td>
</tr>
<tr>
<td>• Present and projected contaminant loadings and levels of treatment.</td>
<td>• Projected changes in water use and public attitudes to water quality.</td>
</tr>
<tr>
<td>• Factors limiting waste assimilation (dilution flows, system sensitivity, synergistic effects).</td>
<td>• Water quality required to maintain important water uses (expressed as provincial water quality criteria and objectives for specific water bodies).</td>
</tr>
<tr>
<td>• Opportunities to enhance water quality and waste treatment.</td>
<td></td>
</tr>
<tr>
<td>(c) WATER ALLOCATION (QUANTITY)</td>
<td></td>
</tr>
<tr>
<td>• Surface water flows (annual hydrograph, low flows and peak flows for designated return periods).</td>
<td>• Consumptive uses (domestic, agriculture, industrial).</td>
</tr>
<tr>
<td>• Present and potential storage.</td>
<td>• Non-consumptive uses (power generation, flood control, industrial cooling).</td>
</tr>
<tr>
<td>• Groundwater resources.</td>
<td>• In-stream uses (fish, waste dilution, water-based recreation).</td>
</tr>
<tr>
<td>• Factors limiting supply (water quality, basin characteristics).</td>
<td></td>
</tr>
<tr>
<td>• Opportunities to modify/enhance supply)</td>
<td></td>
</tr>
</tbody>
</table>
1. The broad definition of use from tangible human consumptive uses to the more ethical considerations of environmental quality and biodiversity conservation; and

2. The way in which resource integration is accomplished; i.e. the relationship between water allocation, flow and quality and the effects of this relationship on water use - both consumptive and in-stream.

The manner in which management objectives and strategies are defined, given different supply/use relationships, is shown in Table 7. It will be apparent from this table that the only situations in which a range of management options must be considered are where supply is less than use but enhancement of supply is possible, and where supply is less than use but no enhancement of supply is possible. In each case the environmental management objectives chosen will be the most appropriate level of quality/quantity consistent with provincial policy and regulation, economic efficiency, public expectations and long-term stewardship of the resource.

It must be stressed that sub-regional environmental plans are meant only for internal Ministry of Environment and Parks guidance, and are not integrated resource management plans in any broader sense. They establish objectives that the Ministry believes are desirable and defensible, but perhaps more important, they also indicate the constraints to meeting those objectives. Constraints may relate to policy or legislation, to funding, or to potential conflicts with other economic sectors. If the constraints can be overcome, then the objectives may be achieved: if not, then the objectives and the plan are revised. The plans thus become a means by which the Ministry can argue its case where resource trade-off decisions are to be made, and a context within which the Ministry can adjust its management strategies and activities to deal with the environmental consequences of those decisions. Accordingly, management strategies and activities proposed in a plan will fall into four basic categories:

1. those that the Ministry is legally obliged to undertake;
2. those that fall within the Ministry's mandate, and can be implemented with existing staff and funding;
3. those that fall within the Ministry's mandate, but will require an enhanced level of funding or staffing; and
4. those that cannot be undertaken before a resource conflict is resolved or significant negotiations with another organization are completed.

The last category encompasses many of the interactions with industrial developments, and it is the supply/use analysis that establishes the context for the evaluation of environmental impacts and the development of mitigation strategies. Figure 3 illustrates the range of supply/use conditions that might have to be considered in addressing project impacts. Figure 3(a) represents a situation of relative resource abundance where the impact of a project does not impair public use values. If the impact is reversible, the main form of mitigation required may be little more than on-site rehabilitation at the end of the project. If the impact is irreversible, then either the
TABLE 7. DEFINITION OF MANAGEMENT OPTIONS, OBJECTIVES AND STRATEGIES.

<table>
<thead>
<tr>
<th>Relationship Between Supply and Use</th>
<th>Probable Management Objective</th>
<th>Management Strategies</th>
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</thead>
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| Cannot be determined (information lacking). | Maintain current status of environmental resources. | • Set conservative use levels.  
• Undertake inventory and research to quantify supply/use relationship. |
| Supply > use. | Maintain current status of environmental resources. | • Identify and preserve options for future management.  
• Enhance use if appropriate. |
| Supply < use.  
Enhancement of supply is possible. | Enhance environmental resource to desired level of quality/quantity. | • Limit use in interim.  
• Enhance quality/quantity.  
• Protect resource and manage impacts of other land uses. |
| Supply < use.  
No enhancement of supply possible. | Maintain best level of environmental resource quality/quantity possible under the circumstances. | • Limit use to sustainable levels.  
• Protect resource and manage impacts of other land uses. |
FIGURE 3. RESOURCE SUPPLY, RESOURCE USE AND PROJECT IMPACTS

3(a) Supply exceeds projected use.

3(b) Projected use exceeds supply, deficit aggravated by project impact.

3(c) Projected use exceeds supply, deficit aggravated by additive impacts of several projects.
resource loss is accepted with or without compensation, the project is re-designed, or the project is rejected.

Figures 3(b) and 3(c) are variations on a similar theme. In each case, a point is reached where the resource is no longer able under present management to sustain public use expectations, and the deficit is aggravated by the impact of a development project or the cumulative impacts of several. A number of decisions are possible in these situations.

- If enhancement of the resource is not possible or is unlikely to be cost-effective;
  - the project could be rejected, or
  - the project could be accepted, with or without compensation, and the public told that they can no longer expect the level of access to the resource that they previously enjoyed.

- If enhancement of the resource is both possible and cost-effective, and Government decides that public use expectations should be met;
  - the project or projects are accepted on the condition that the proponents undertake treatment or enhancement programs to fully mitigate project impacts, and
  - Government upgrades its capacity to meet its identified management responsibilities.

In both 3(b) and 3(c), but more particularly in the latter, cooperative planning would be necessary in order to ensure that both the mitigation activities of project proponents and the management activities of government are complimentary and properly integrated.

CONCLUSION

The Mine Development Review Process has become a relatively permanent feature of the regulatory environment governing mining proposals in British Columbia. Over the past ten years it has undergone significant evolution to improve its credibility, responsiveness and efficiency. It has gained a measure of support, albeit perhaps for different reasons, from Provincial politicians, agencies from three levels of government - federal, provincial and municipal, the public, and the mining industry. In these ten years the process and its two predecessors have dealt with 74 mining proposals of which 59 have been granted approval-in-principle, 41 subsequently went into production and 15 became dormant in the process. At the time of writing there are 22 projects under active review.

The process, however, suffers from a fundamental problem common to environmental assessment processes the world over. This problem is due largely to the fact that environmental assessment has usually been established as a planning process that applies primarily to the integrated feasibility design of large, geographically-limited development projects, and the term itself implies a preoccupation with the environment, to the exclusion of economic and social considerations. The latter problem has been
resolved over the past decade with the evolution towards more comprehensive environmental, social and cultural assessment processes (ESIA). The problem of process isolation, however, continues to be a serious problem limiting the effectiveness and efficiency of ESIA. ESIA processes have been established in many (if not most) jurisdictions as the major integrated planning mechanism, with little or no commitment to pro-active, "higher-level" inter-sectoral integration and conflict resolution. As a result, ESIA processes have often been called upon to deal with strategic, policy and "regional" issues for which they are ill-designed and which usually can't be effectively dealt with on a project-by-project basis; resulting, inevitably, in frustration and acrimony for the ESIA participants.

Development and resource planning takes place at a number of discrete, but interconnected, planning levels from strategic policy, legislation and program planning at the national/provincial level to operational planning and implementation at the local level • all with important environmental and social assessment components. Viewed in this context, environmental and social assessment should be seen as a planning function that applies to all levels of integrated planning. If environmental and social considerations are incorporated at all levels of an integrated planning system, the various levels begin to compliment one another in the following ways:

• strategic environmental, social and economic integration and harmonization at the level of national/provincial development goals, objectives, legislation and policies that 1) serve to steer towards sustainable forms of development, thereby avoiding the waste of resources on projects that lack economic viability or are damaging to the natural and social environments, and 2) ensure the equitable inclusion of all elements of the community in the benefits of development;

• regional levels of "spatial" planning provide the opportunity to avoid many inter-sectoral conflicts and environmental/social impacts through land-use zoning, infrastructure planning and agreements on management responsibility and tenure;

• traditional ESIA moves from its current narrow preoccupation with environmental and social impact analysis to become a comprehensive planning tool for major industrial development and resource management projects - including the collection of baseline information, impact management, and project monitoring and evaluation; and

• environmental standards, codes-of-best-practice, and conditions attached to permits and approvals become the means of managing the impacts of operational activities, and provide the basis for operational compliance monitoring and legal enforceability throughout the project's life cycle.

The Environmental Management Division of the Ministry of Environment and Parks has begun the process of establishing a multi-level, integrated environmental planning system that would serve to provide a more efficient environmental management context for processes like the Mine Development Review Process. It is not, nor is it
meant to be, a neutral land and resource use planning process. Rather, it is the Ministry's attempt to prepare itself for such a process, which is long overdue in British Columbia. The intent of this planning system is to establish measurable defensible management objectives for the resources under the Ministry's mandate (wildlife, water quality and quantity, air quality and freshwater recreational fisheries), to integrate the management activities of the Ministry, and to contribute to budget preparation. In the context of the Mine Development Review Process, these policies and plans provide the rationale for regulatory activities such as water licensing and waste management permitting, and a transparent basis for negotiations on impact mitigation with mine development proponents and other resource management agencies of government.

In the end, however efficient the Mine Development Review Process and supporting resource planning systems, they face a fundamentally serious limitation that relates to the process's ability to act as a forum for conflict resolution and decisions on resource trade-offs. In theory, the process can lead to a comparison of economic and social benefits of a mine proposal and the resource values placed at risk by the project, and lead to a political decision to accept or reject the project based on a perception of greater public good. In practice, however, such decisions are highly constrained by a mineral tenure system that has not changed substantially in over a century. Ideally the management of common-property resources involves the following sequence: resource inventory; assessment of competing resource values; trade-off and conflict resolution; resource management integration, and finally, resource allocation and consignment of tenure. Mineral resources are, perhaps, the only sector where tenure is granted before resource inventory or any consideration of conflict resolution. The tacit assumption by those managing the mineral resource has been that mining is the pre-eminent land use and minerals should be developed wherever they occur. It has only been in the last decade that this view has been challenged by a growing public concern for wilderness values and for sensitive wildlife populations whose continued existence is placed in jeopardy by mineral tenures. Resource decisions involving not how mining should proceed, but whether it is an acceptable land use at all in a given area, are frustrated by the possibility of litigation and substantial compensation payments to holders of pre-existing mineral tenure. The continued public credibility of the Mine Development Review Process depends on a timely, reasonable, and constructive resolution to this "fatal flaw" in British Columbia's natural resource management system.