BRITISH COLUMBIA
Ministry of Agriculture and Lands

GUIDELINES FOR SOCIO-ECONOMIC AND ENVIRONMENTAL ASSESSMENT (SEEA)

Land Use Planning and Resource Management Planning

Strategic Land Policy & Legislation Branch
Economic Analysis Section
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MINISTRY OF AGRICULTURE AND LANDS

The British Columbia Ministry of Agriculture and Lands (MAL) was established in June 2005. With respect to lands, the ministry's mandate includes management of Crown land and resources in a manner consistent with the economic, environmental and social goals of the provincial government. An agency within MAL, the Integrated Land Management Bureau (ILMB), is responsible for developing, implementing, and revising land-use plans. The Strategic Land Policy & Legislation Branch of MAL provides economic analysis expertise to the ILMB with respect to land use planning.

ACKNOWLEDGEMENTS

This document builds on previous sets of principles and guidelines, and reflects the work and thinking of many people.

- In 1993, Marvin Shaffer & Associates produced the document *Interim Guidelines for the Land and Resource Management Planning (LRMP) Process*, which were applied in numerous LRMP processes throughout British Columbia.
- In 1995, the guidelines were reviewed by the Ministry of Environment, Lands and Parks, in cooperation with other ministries and several consultants (Julian Griggs of Dovetail Consulting, Colin Rankin of Salasan Associates, Julie Paul of ARA Consulting Group, and Larry MacDonald). They produced the document *Refining the Use of the Multiple Accounts Framework for LRMP: Summary of Consultants' Recommendations.*
- In 2001, the Ministry of Sustainable Resource Management (MSRM) prepared a new working draft of guidelines for land use planning, with the help of Gary Holman (Consulting Economist) and Eliot Terry (R.P. Bio).
- In 2002, MSRM sent the draft guidelines to three academic reviewers for comment: Brian Scarfe (BriMar Consultants Ltd), John F. Helliwell (University of British Columbia) and Daniel Rondeau (University of Victoria). MSRM also commissioned Claude Pierce and Sylvie Lefebvre of Pierce Lefebvre Consulting to develop a "guiding principles" document that incorporated the findings of the academic reviewers. As part of that work, Claude and Sylvie facilitated a workshop that included consultants and representatives from provincial government agencies.
- In 2003/2004, MSRM, with the assistance of Pierce Lefebvre Consulting, revised the 2001 draft guidelines to incorporate the guiding principles.

In 2005, the land use planning functions of MSRM were integrated into the Ministry of Agriculture and Lands. The Strategic Land Policy Branch of MAL further developed and completed the guidelines in 2006 – with assistance from BC Stats, Tourism BC, and the ministries of Aboriginal Relations and Reconciliation, Energy, Mines and Petroleum Resources, Environment, Forests and Range, and Tourism, Sport and the Arts.

We express our great appreciation for our provincial government colleagues and the professional consultants who have done applied SEEA work in many land use planning processes over the years. Their experience has helped our understandings considerably.

We acknowledge and thank all who have contributed to these guidelines in their various ways. The Strategic Land Policy & Legislation Branch is responsible for all the content.

PREFACE

These guidelines provide a framework for analysis and presentation of socio-economic and environmental assessments (SEEAs) for land use and resource management planning. They are applicable to large-scale Land and Resource Management Plans (LRMPs), to smaller-scale Sustainable Resource Management Plans (SRMPs), and to other processes requiring socio-economic and environmental assessment.

We intend the guidelines to be a reference document for analysts and for those seeking greater understanding of SEEA reports. The guidelines can be accessed on-line at the Strategic Land Policy and Legislation Branch website.
www.al.gov.bc.ca/clad/strategic_land/econ_analysis

We suggest that readers complement their review of the guidelines by referring to a recent application, such as the SEEA report completed for the Morice LRMP Table Recommendations (available at the website).

The general approach recommended here is that a base case is compared with alternative land use plan configurations. Economic, social, and environmental implications are considered, and trade-offs are identified with a view to finding solutions to land use conflicts. To deal with the large number of complex and inter-related issues, the approach follows a "multiple accounts" format which allows for the inclusion of quantifiable outcomes and for qualitative analysis of outcomes that are not quantifiable (especially social valuations and environmental outcomes). Components of cost-benefit analysis are part of the overall framework.

The guidelines reflect the review, comment, and working experience of professional colleagues and associates in provincial government agencies, in universities, and in professional consulting groups. The focus is on practical methods which can be used to obtain succinct and reliable SEEA information with the time, funding, and technical resources typically available. The guidelines are not definitive, and our intention is to further develop them as we acquire new understandings and experience.

We would be pleased to receive constructive comments.

Using This Document

- **Bookmarks at the left-hand side of the screen allow document navigation in the PDF format.**
- **Headings in the Table of Contents are also links allowing quick access to specific sections of the document (CTRL + mouse-click). Within the document, additional links are also provided to areas of related discussion.**
- **Where possible, we have provided active web-links to pertinent information (CTRL+click).**
- **British Columbia government websites are subject to change due to ministry reorganisations. If a link does not work, we suggest that you conduct an Internet search for the document title, or contact the relevant agency for a current reference.**
- **Terms defined in the glossary appear in bold font the first time they are used in the document.**

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EXECUTIVE SUMMARY

British Columbia's publicly-owned Crown lands currently comprise about 94% of the province, an area of about 900,000 square kilometres. Land use planning recognises that there are pressures from many different interests, and helps to ensure that land and resource management decisions take into account the needs of communities, the economy and the environment. Public participation is often a key component of planning processes, and stakeholder consensus has usually been sought.

Planning the use and stewardship of provincial lands, waters and natural resources involves consideration of all the potential uses and how they are valued.

Socio-Economic and Environmental Assessment (SEEA) provides planners, stakeholders and decision makers with three types of information:

1. Background information on the socio-economic and environmental context of a plan area and its communities, as well as an inventory of lands and resources which are, or could be, important to the local area and/or the province as a whole.
2. A description of the key socio-economic and environmental parameters that may be affected by resolution of the resource management issues addressed by the plan.
3. An assessment of the expected socio-economic and environmental implications of the plan and alternate management scenarios relative to a base case (the "status quo"), along with an assessment of the uncertainties involved.

The SEEA should inform the planning process, be objective and transparent, and help plan participants, consensus builders and decision makers to understand implications.

This SEEA guidelines document provides a consistent format for assessing and documenting implications. As shown in Table A, below, the guidelines recommend focusing on the following categories of implications: Economic Development, Provincial Government Finances, Social Implications (including community wellbeing), Specific Aboriginal Implications, Net Economic Value, and Environment. Each category should be reviewed at the local level and at the provincial level, as appropriate.

Clear, concise writing and consistent, complete documentation are essential in SEEA reports. To facilitate comparisons, we recommend the inclusion of a summary matrix that highlights advantages, disadvantages, associated uncertainties, and solutions. The SEEA also may use weighting and ranking techniques to facilitate trade-off analysis.

Particular care should be taken to present not only quantified results, such as forest sector impacts, but also non-quantified outcomes (often in the social and environmental areas) that may be highly significant.

The guidelines are not definitive, and the intention is to improve them over time, in particular with respect to social and environmental implications.

Table A: SEEA Implications Categories and Key Indicators

Category	Analysis Techniques	Key Indicators
Socio-Economic Assessment		
Economic Development (local and provincial) by sector (e.g., forestry, mining, oil and gas, tourism, recreation, agriculture, trapping, botanical forest products).	Economic Impact Analysis	Expected economic activity including indicators such as number of existing jobs, potential number of jobs, indirect and induced jobs and income.
Provincial Government Finances	Fiscal Impact Analysis	Net provincial government revenues.
Social Implications (mainly local area). Includes local communities and aboriginal communities.	Social Impact Analysis	Population, jobs and incomes, distribution of job opportunities, resource-based recreation activities, and other aspects of wellbeing.
Specific Aboriginal Implications	Social and Heritage Impact Analysis	Specific Aboriginal implications that cannot be discussed in the Economic Development and Social Implications sections.
Net Economic Value (mainly provincial) by sector (e.g. forestry, mining, oil and gas, energy, tourism, recreation, and environment). Net Economic Value should consider existing and potential commercial and non-commercial sectors that depend on the resource.	Benefit – Cost Analysis	For commercial sectors: product prices before tax less production costs (economic rent); in addition, estimated rent taken by labour / industry. Net of any externalities. For non-commercial sectors: some measure of consumer surplus, i.e. what people would be willing to pay for the activity or amenity above what they are paying. Discussion of implications for natural capital and ecosystem goods and services.
Environmental Assessment		
Environment (provincial and regional)	Environmental Risk Assessment	Risk levels associated with different scenarios and quantitative and qualitative measures of outcomes on key fine filter and coarse filter indicators.
Socio-Economic and Environmental Assessment		
Social, Economic and Environmental Assessment	SEEA	Merges the Socio-Economic Assessment and the Environmental Assessment results and demonstrates synergies and trade-offs.

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1.0 Introduction

1.1 Purpose of SEEA and SEEA Guidelines

British Columbia is Canada's third largest province, with a land area of close to 950,000 square kilometres. About 94% of the province is currently provincial Crown land. There are land use pressures from many different interests, including demands for forestry, mining, tourism, conservation, oil and gas, agriculture, recreation, settlement, and cultural requirements. Land use planning helps to ensure that resource management decisions take into account the needs of communities, the economy and the environment.[1]

The purpose of a socio-economic and environmental assessment (SEEA) is to provide planners, stakeholders and decision makers with three types of information:

- Background information on the socio-economic structure of a **plan area** and its communities, as well as an inventory of land and/or marine based resources which are, or could be, important to the area and/or province.
- A description of the key socio-economic and environmental parameters that may be affected by the plan.
- An assessment of the expected socio-economic and environmental implications relative to a **base case** scenario, along with an assessment of the uncertainties involved in the analysis.

SEEA of land and/or resource management initiatives touches on the key elements of sustainability – the balancing of present and future social, economic, and environmental needs to provide the best possible collective returns to society.[2]

The purpose of the *SEEA Guidelines* is to provide a consistent format for assessing and documenting implications.

These guidelines have been developed for the analysis of scenarios specified for large-scale strategic land and resource management planning. However, the recommended principles and procedures could be applied to many projects and policy options which have social, economic and environmental implications, including oil and gas pre-tenure plans, coastal use plans, plans for the recovery of specific **wildlife** species, and the Ministry of Forests and Range Timber Supply Review (TSR).

[1] For information on land use planning in British Columbia, including SEEA reports for LRMPs, see the following website and associated links: http://ilmbwww.gov.bc.ca/lup/lrmp

[2] The World Bank, following the World Commission on Environment and Development (the "Bruntland Commission"), broadly defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs", and emphasises the social, economic, and environmental dimensions of sustainable development. For further discussion, see www.worldbank.org/depweb/sd

The guidelines recognise the data and time constraints on any evaluation process, as well as the uncertainties about the cause-effect relationships or "linkages" between land use changes, resource management initiatives, and socio-economic and environmental values. Despite the limitations and uncertainties involved, a structured framework and approach allow for more informed decision-making.

1.2 Document Layout

The guidelines document is arranged as follows:

- "Guiding principles" of evaluation are shown in text boxes throughout the document.
- **Section 2** presents the SEEA framework, including key methods of analysis, guidelines for defining management options, data requirements, and assessing the scope and timing of an SEEA.
- **Section 3** describes the evaluation categories: Economic Development, Provincial Government Finances, Social Implications, Specific Aboriginal Implications, Net Economic Value, and Environmental Assessment.
- **Section 4** discusses the communication of findings, including the integration of the Socio-Economic Analysis and the Environmental Risk Assessment into an SEEA, the presentation of data, demonstration of trade-offs, and the requirements for clear writing, good documentation, and transparency.
- **Section 5** presents a summary and concluding remarks.
- Appendices provide additional analytical tools and information.
    - **Appendix 1: Overview: Area Analysis, Resource Analysis, and SEEA**
        - including a diagram showing the inter-linkages between these types of analysis in the land use planning process.
    - **Appendix 2: Base Case Scenario and Management Options**
        - definitions and methods
    - **Appendix 3: Background GIS Data**
        - including a table showing GIS summary "area statistics" by land use zone category
    - **Appendix 4: Forest Sector Methodologies**
        - timber supply, operational concepts, and direct and indirect/induced employment
    - **Appendix 5: Tourism Sector Methodologies**
        - tourism activities, assessment of implications, use of land-based statistics
    - **Appendix 6: Recreation Sector Methodologies**
        - recreation activities and implications

- **Appendix 7: Mineral Sector Methodologies**
  – types of implications, mineral potential and GIS data, use of illustrative examples
- **Appendix 8: Petroleum Sector Methodologies**
  – petroleum potential, use of production forecasts
- **Appendix 9: Local Area Indirect And Induced Effects**
  – local area employment multipliers and their limitations
- **Appendix 10: Provincial Economic Development Implications**
  – direct and indirect / induced employment
- **Appendix 11: Net Economic Value Methodologies**
  – examples provided for key sectors
- **Appendix 12: Tools For Environmental Risk Assessment**
  – habitat supply modelling and area analysis
- **Appendix 13: Economic "Building Blocks" Reports**
  – financial, operational, and regulatory information for a range of resource-based business types
- **Appendix 14: Data and Information Sources**
  – data types, documents, and sources for each of the categories of implications
- **Appendix 15: Glossary**
  – definitions of terms used in both Socio-Economic Analysis (SEA) and Environmental Risk Assessment (ERA)
- **Appendix 16: References**
  – key documents and sources of further information (references are also provided throughout the document).

Please note that we have not discussed evaluation methodologies for several sectors that may be affected in some planning processes: renewable energy (large scale and small scale hydro, geothermal, and wind power), non-timber forest products, agriculture, trapping and commercial fishing. In cases where it is appropriate to focus on those sectors, we encourage analysts to discuss suitable approaches with MAL economics staff, who will consult with other provincial agencies as appropriate.

2.0 SEEA Framework

This section discusses the main elements of the SEEA framework and data requirements, including: key methods of analysis; defining scenarios; the SEEA format; the scope and timing of an SEEA; and data requirements

2.1 Methods of Analysis

The socio-economic and environmental implications of land and/or resource management initiatives can be assessed from a number of perspectives, including:

1. **Economic Impact Analysis** – estimates implications for income and employment in specific communities, regions, or the Province as a whole.
2. **Social Impact Analysis** – identifies and evaluates implications for demographic, local government, and community concerns.
3. **Benefit-Cost Analysis** – estimates the differences in net value of the market and non-market outputs generated by the plan and/or each scenario from an "economic efficiency" or "**Net Economic Value**" perspective.
4. **Environmental Risk Assessment** – estimates the changes in likelihood of adverse environmental effects resulting from human activities.

Each perspective alone addresses only specific aspects of implications. An SEEA must take a comprehensive approach by assessing the complete array of implications and presenting the information in tabular or matrix format to facilitate review.

Guiding Principle
There is a need for SEEAs to demonstrate the advantages and disadvantages of the plan and/or each management scenario and assist decision makers and stakeholders in weighing the implications involved. The use of weighting and ranking techniques may help to demonstrate differences in expected outcomes between scenarios.

Trade-off analyses may involve eliciting value judgments from interested parties on what they believe are appropriate trade-offs or weights placed on different plan objectives (e.g. whether access management planning designed to improve the co-existence of industrial activities, **wildlife habitat**, commercial tourism, and recreation should put more emphasis on one value than another).

Guiding Principle
SEEAs must express the levels of uncertainty associated with estimates, including uncertainty about methods, socio-economic data, biological data and future expectations.

To express the nature and extent of uncertainty, the analyst should estimate the most likely implications, and where applicable, provide a range of plausible outcomes. The range must be based on defensible data and methodology, and not on unsubstantiated "best" or "worst" case estimates. Trade-off and sensitivity analysis may be used to help assess how different estimates may affect a specific decision.

2.2 Defining Scenarios

The assessment of socio-economic and environmental implications requires a comparison of what might occur under alternative scenarios relative to a "base case".

- In most cases, the socio-economic base case should be the "status quo", including any recent regulations, and assuming that external factors such as commodity prices and regulatory policy follow existing trends or remain the same. The SEA base case consists of existing and anticipated resource management strategies and land use designations, as well as the existing and anticipated biophysical, environmental, economic and social trends in the area – including the potential for resource use conflict to frustrate the realisation of socioeconomic and environmental values.
- For the environmental assessment, the base case is defined with reference to the range of **natural disturbance** (see Section 3.6.1).

Guiding Principle
Those involved with the planning process must provide a land and/or resource management plan and/or initiatives (including a base case scenario) to the analysts for assessment. These must be based on an understanding of both the resource potential of the land base, the interests of communities in the plan area, as well as broader regional and provincial interests.

Early in planning processes, it may be useful to evaluate several scenarios (e.g. 3 to 4, including the base case). The scenarios should be different enough from one another to facilitate meaningful comparisons. Following completion of a planning process, an SEEA would focus on a comparison of the land use plan and the base case scenario.

Appendix 2 presents more detail on the methodology for defining including the base case and alternative scenarios.

2.3 SEEA Format

Land and resource management decisions may lead to complex and inter-related effects, so evaluation must be sufficiently comprehensive, use a clear and consistent framework to facilitate comparisons, and include immediate and future implications.

These guidelines recommend focusing on the following categories of implications: Economic Development, Provincial Government Finances, Social Implications, Specific Aboriginal Implications, Net Economic Value, and Environment. These categories relate to the analysis methods identified above, namely, **economic impact analysis**, **social impact analysis**, benefit-cost analysis and environmental risk assessment.

This "**multiple accounts**" format recognises that the implications of land use and resource decisions cannot be properly captured with a single impact indicator or measure, and allows for the inclusion of **quantifiable** outcomes and for **qualitative** analysis of outcomes which are not quantifiable (especially social valuations and environmental outcomes).

Table 1. Categories of Implications and Key Indicators

Category	Analysis Techniques	Key Indicators
Socio-Economic Assessment		
Economic Development (local and provincial) by sector (e.g., forestry, mining, oil and gas, tourism, recreation, agriculture, trapping, botanical forest products).	Economic Impact Analysis	Expected economic activity including indicators such as number of existing jobs, potential number of jobs, indirect and induced jobs and income.
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Environmental Assessment		
Environment (provincial and regional)	Environmental Risk Assessment	Risk levels associated with different scenarios and quantitative and qualitative measures of outcomes on key fine filter and coarse filter indicators.
Socio-Economic and Environmental Assessment		
Social, Economic and Environmental Assessment	SEEA	Merges the Socio-Economic Assessment and the Environmental Assessment results and demonstrates synergies and trade-offs.

While each of the categories constitutes a different evaluation perspective, they are not mutually exclusive, and care must be taken not to "double count" impacts. For example, stumpage on timber is a component of provincial government revenues and can also be used as a proxy for Net Economic Value.

Local and Provincial Levels of Review

Where appropriate, each category should be reviewed at the local level and at the provincial level. Capturing the impacts at the local and provincial levels allows the assessment to identify whether the distribution of benefits and costs falls unduly on a specific community, industry or population group. The broader provincial perspective will help provide an overall assessment of the benefits and costs.

Economic and environmental implications tend to have both local and provincial aspects. Community implications tend to be primarily local, while Net Economic Value and provincial government financial impacts tend to be primarily at the provincial level.

Analysts should define the local area after having identified the sectors and communities that directly and heavily depend on the plan area resources. The local area boundaries often correspond to the plan area boundaries, but this is not always the case. For Land and Resource Management Plans (LRMPs), the areas covered by the plans tend to be large and the local area will generally coincide with the plan area. For plans that cover a relatively small land area, some of the impacts of the plan may flow outside the plan area into adjacent communities and **ecosystems**, so what is considered the "local area" will be larger than the plan area.[3]

The geographic boundaries of the local area can differ for different resource values. It is quite common for environmental values, for example, to be examined from an ecosystem perspective that does not match plan area boundaries.

2.4 Scope and Timing

2.4.1 SEEA Scope

We distinguish three broad levels of scope: comprehensive, focused, and condensed.

1. **Comprehensive SEEA** – In a comprehensive SEEA, important resource values covered by the plan would be analysed using the framework presented in these guidelines. The SEEA would likely include a socio-economic profile of the plan area

[3] The Southern Rocky Mountain Management Plan (SRMMP) area is provides an example of a plan area being smaller than the local impact area. SRMMP area timber resources are processed in communities just outside the plan area. To focusing only the SRMMP area, and capture the impacts on neighbouring communities only in a provincial context, would give an erroneous view of the distributional impacts of the SRMMP. For forestry, the local area for the SRMMP was therefore defined to include the nearby communities. The SRMMP can be accessed at:
www.al.gov.bc.ca/clad/strategic_land/econ_analysis/projects_pubs

and adjacent areas that the plan directly affects, a detailed review of environmental resources in the plan area and surrounding region, and an assessment of the land use plan and/or management scenarios.

2. **Focused SEEA** – Only resource uses that are proving difficult to reconcile in the planning process would be analysed in a focused SEEA. The SEEA guidelines would be followed, but the assessment would be abbreviated. The assessment would include alternative scenarios. The SEEA would contribute to decision-making about reconciling the conflicting resource uses.[4]

3. **Condensed SEEA** – Analysis in a condensed SEEA would be limited to projecting social and economic impacts of the land and/or resource management plan (no other scenarios). It would contain a brief description of current socio-economic conditions in the study area, highlighting the main drivers of resource based economic activity.

   A condensed SEEA is likely to be most suitable for a compact resource management plan which addresses relatively fewer resource management issues. An analyst preparing a condensed SEEA would rely on GIS data, Building Blocks[5] information, and government technical staff for quantitative information, and would not undertake new quantitative analysis.

   The main purpose of the condensed SEEA would be to demonstrate how the plan would positively or negatively affect current and **short-term** economic activity and value, and if negative effects are anticipated, recommend **mitigation** options. A condensed SEEA would require less preparation time, and its completion could be coordinated with the completion of the first draft of a land use plan.

The decision tree presented as Table 2, below, is intended to help in the determination of the appropriate scope of an SEEA.

2.4.2 Timing

When an SEEA should be started and how long it might take depends on the complexity of the issues and whether a comprehensive, focused or condensed SEEA is planned.

In many cases, an SEEA should be timed to offer information for decision-making as resource objectives are being developed and finalised. In these instances, the SEEA should start soon after a **resource analysis** is conducted for the resource values and plan sub-area(s) in question, particularly when specific resource values are proving difficult to reconcile in the planning process. The SEEA should then be integral to plan development, and not completed only after a final plan is developed.

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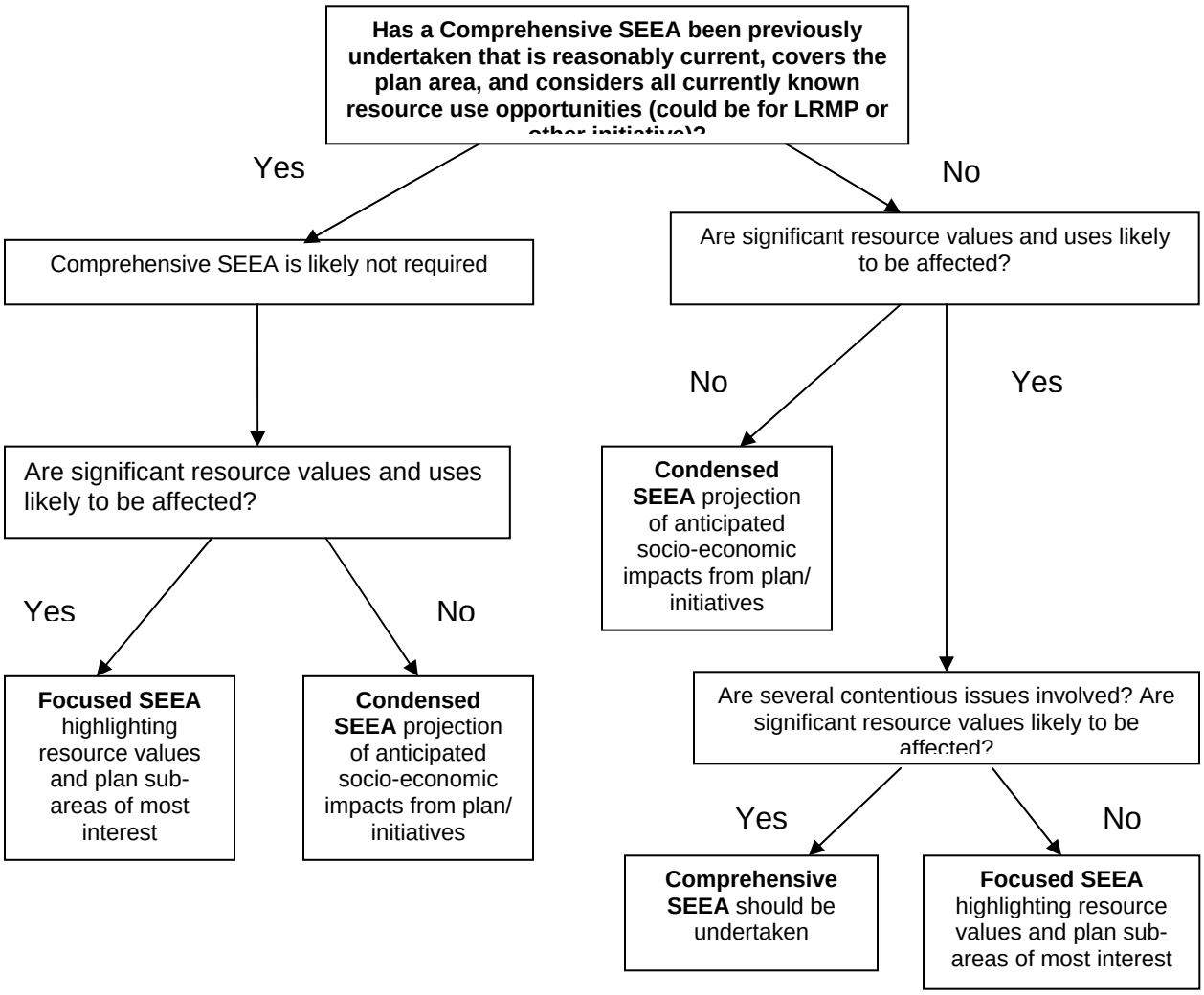
[4] For an example, see *The Benefits of Managing Forestry and Tourism at Nimmo Bay* (BC Ministry of Forests, 2003) at www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Rec036.htm
See also, BriMar Consultants Ltd., *Socio-Economic Assessment of the Besa-Prophet Pre-Tenure Plan*, BC Ministry of Sustainable Resource Management, August 2002.

[5] The MAL "Building Blocks" are short reference papers that contain concise business and sectoral information for a broad range of resource-based business types in British Columbia. The Building Blocks can be accessed at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis/data_sources

The time required for an SEEA is also dependent on the availability of information from secondary sources. If data must be developed from primary sources, such as tourism or forestry operator surveys, then more time is required. The time requirement will also depend on the degree to which data requirements (such as GIS data, spatial timber supply analysis, wildlife inventories, or **habitat** modelling) are provided by technical staff and resources of the provincial government or other organisations.

As discussed in Appendix 1, for a comprehensive SEEA we suggest allowing 8 - 10 weeks for completing the GIS and timber supply analysis (once the data and analysts are in place), and then another 8 - 12 weeks to do the SEEA . Substantial additional time may be required for report write-up, review of drafts by provincial agencies, communities, other stakeholders, and First Nations. If there are complications and/or a lack of resources, the process could take longer. Focused and condensed SEEAs may be completed more quickly.

Table 2. SEEA Decision Tree



Source: Based on the decision tree in the *Resource Analysis Guide for Sustainable Resource Management Planning* (Figure 5, p. 29). See http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background/rag

2.5 Data Requirements

This section describes the data required for conducting an SEEA, focusing on the two major types required at the outset: biophysical mapping and resource analysis, and background socio-economic information.

2.5.1 Biophysical Mapping and Resource Analysis

Biophysical mapping and assessment of resources help to assess the range of values present in a plan area. Usually, provincial government agencies and technical staff supply the socio-economic assessment analysts with extensive information and expertise, including Geographic Information System (GIS) data, timber supply analysis, and analysis related to other resources.

GIS Area Statistics

GIS mapping can help quantify the extent to which various mapped resource values and activities exist in a plan area, including (but not limited to) the following:

- **Timber Harvesting Land Base** and mature timber volume
- recreation/ tourism opportunities, features and facilities
- mineral/oil and gas potential, tenures and occurrences
- agricultural range areas, animal unit months and high **capability** lands
- aboriginal cultural heritage sites, other traditional use areas, aboriginal values
- wildlife habitat
- **biogeoclimatic** units, and
- **site series** or site series surrogates

GIS analysis is able to overlay multiple data layers to provide information on spatial interaction. For example, data on resource values (e.g. THLB) can overlay the types of resource management zones (e.g. **Protected Areas**), thereby indicating the extent to which the zones might affect specific resource values.

- LRMPs include resource management zones such as Protected Areas (PAs) and other types of zones where management direction recognises specific values.

- Landscape Unit Plans or Species-at-Risk Recovery Plans tend to apply different management strategies to wildlife habitat areas, **riparian** areas, and other areas with specific values. For those types of plans, GIS data can overlay the habitat, riparian and other areas on the resource values. This allows, for example, the assessment of how much Timber Harvesting Land Base or mineral potential may be affected by specific management direction for caribou habitat.

Appendix 3 provides additional detail, including a template for a table of GIS summary area statistics shown by land use zone.

Resource Analysis

Based on the area analysis and resource management strategies, the resource analysis assesses short-term and **long-term** implications for natural resource use activity – such as timber harvest levels, minerals and energy production, fish/wildlife populations, cultural heritage uses, agricultural production, tourism, and water use. A common example of resource analysis in this context is the use of **timber supply models** to assess the impacts of a plan on the Timber Harvesting Land Base and on timber supply over time.

The *Resource Analysis Guide for Sustainable Resource Management Planning* provides a resource analysis framework and detailed techniques for specific resource sectors.[6] This discussion is also relevant to other levels of land use planning.

[6] The guide can be accessed at: http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background

2.5.2 Background Socio-Economic Data

An early step in preparing a socio-economic assessment is to develop background information on the socio-economic structure of the plan area or local area (usually called the "SEA Base Case Report").[7] The *Resource Analysis Guide* lists the following questions to help guide the collection of information on social and economic factors:

- What are the demographics of the region (population, labour force, age distribution, levels of education, etc.)?
- What are the unemployment rates in various communities?
- Which economic sectors are the most important in the area and what has been the trend with regard to these sectors?
- What is the current quality of life in the communities and surrounding region?
- Are there specific First Nations issues?

The background socio-economic data typically include a general overview of the population, labour force, and income dependencies for the region and the major communities in the plan area. While general information is useful to provide a context for the analysis, the background socio-economic data should primarily focus on the activities that directly depend on plan area resources that are likely to be managed differently under the plan than they would be otherwise.

When data on resource use are available only for certain geographic areas, or when management unit boundaries are different than the plan area, the analyst must attempt to estimate how much of the resource use indicated by the data is actually dependent on the plan area resources. For example, data on guided hunting activities for Wildlife Management Units (WMUs) that overlap a plan area may overstate the extent of hunting activity in the plan area if the WMUs cover a larger area, in total, than the plan area. Similarly, where census subdivision boundaries do not significantly coincide with plan area or local area boundaries, some attempt must be made to adjust the data accordingly.

Not all activities carried out in a plan area are likely to be affected by a land and/or resource management plans. Activities that are not likely to be affected need not be documented in detail. For example, it may not be necessary to document front country tourism activities that are unlikely to be affected by a plan that focuses on backcountry wildlife habitat restoration – recreational activities at local lakes or downhill skiing are unlikely to be affected by a plan that focuses on restoring grizzly bear habitat in the backcountry.

The background data should support the evaluation categories outlined in Section 3.0, below. A partial list of data sources is provided in Appendix 4.

[7] For an example, see the *CCLCRMP Socio-Economic & Environmental Marine Base Case* (November 2000), available at http://www.al.gov.bc.ca/clad/strategic_land/econ_analysis/projects_pubs

3.0 Evaluation Categories

This section outlines the steps involved in analysing each of six major categories of implications, namely, Economic Development, Provincial Government Finances, Social Implications, Specific Aboriginal Implications, Net Economic Value, and Environment.[8]

3.1 Economic Development

The assessment of land use plan impacts on economic development identifies the jobs, income, and other appropriate indicators for each major current and future economic sector that depends on the resources of the plan area.

Guiding Principle
An important task of the socio-economic impact assessment is to describe the current (and potential) economic sectors that depend on the resources in the plan area, or may do so in future. In most planning areas, these include some form of forestry (e.g. harvesting, processing, silviculture). Other resource-dependent industries or activities could include: agriculture, aquaculture, commercial fishing, guiding, mineral/petroleum exploration and extraction, energy production, trapping, tourism, and botanical forest products.

The key steps in estimating the economic impacts include:

- describing the current economic sectors that depend on the plan area resources, including estimates of **direct** income and employment;
- estimating **indirect** and **induced** income and employment effects based on employment or income **multipliers** for that sector; and
- forecasting potential future uses of resources and estimating potential future jobs and income that may be generated by the plan area resources.

These are described in more detail below.

3.1.1 Direct Jobs and Income

Guiding Principle
The existing jobs and income reflect the current economic base. Data need to be collected on the direct jobs and income associated with each economic sector that depends on the land based resources in the plan area. To aid in the assessment of impacts expected from the plan and/or each scenario, the current jobs and income should be estimated per unit of output (e.g. per m^3 of wood harvested) for those sectors that will likely be affected by the land and/or resource management plan/initiatives.

Estimating current economic activity first requires the identification of the extent to which

[8] In general, the evaluation methodologies detailed in this section are pertinent to comprehensive SEEAs. Focused and condensed SEEAs would use similar methodologies, but would focus on selected sectors and/or may not be as detailed.

local industries or economic activities are linked to the resources in the plan area. The nature and strength of the cause-effect linkage between industry activities and the resources on which they depend will vary from sector to sector. For example:

- **Forestry** (see Appendix 4) – The management prescriptions in each scenario can directly influence timber supply available over time for harvesting.[9] Other factors to be considered include: the extent to which local processing facilities rely on imported fibre, or on "secondary" products, such as dimension lumber or chips, for which alternative supplies might exist; the proportion of the affected workforce living in the plan area; implications of adjustments such as periodic mill closures; and the possibility that cost and supply impacts can result in threshold effects on timber harvesting and processing operations.
- **Tourism** (see Appendix 5) – The extent to which tourist activity is affected will depend on the importance of the affected resources to the amount and type of tourism in the area. A management scenario may directly affect tourism businesses that depend on "back-country" recreational opportunities in relatively pristine environments but may not affect facilities depending primarily on highway traffic, such as hotels and restaurants in communities. Also, tourism operations may be able to make adjustments to changes in land use by changing the timing and/or areas of operation, or changing the type of product or activity offered.
- **Minerals** (Appendix 7) **and Petroleum Resources** (Appendix 8) – For hidden sub-surface resources, the extent to which existing and potential activities may be affected is particularly difficult to assess. GIS data and analysis can be helpful in quantifying the extent to which various mapped resource values and activities (e.g. **mineral potential**, **mineral occurrences**, or mineral tenures) are overlain by and therefore possibly affected by different types of resource management zones or management strategies applied to individual Landscape Units.

Estimates of income and employment levels generated per unit of production (or dollar of output) in each industry or activity will facilitate the assessment of impacts, particularly if existing activities are affected. These "**coefficients**" will generally be based on the average extent to which income or employment varies with the level of output in each industry or activity (e.g. the number of forest harvesting jobs per cubic metre of harvest or throughput, number of full-time equivalent tourist jobs per dollar of tourist spending). Data may be available from local operators, the provincial government, or industry associations. However, alternative ways in which industry could adjust to throughput changes, and other adjustments, should also be taken into account.

It is useful for the assessment of impacts on current economic activities to differentiate between the local area (usually the plan area) and the provincial impacts. To do so, the

[9] Where possible, comparisons of the base case and other scenarios should be done using timber supply projections which follow Ministry of Forests and Range modelling policy for timber harvest flow projections, which requires the current AAC to be maintained for as long as possible (to minimise short-term impacts), while limiting the harvest declines between decades to no more than 10% and maintaining a smooth transition to the long-term level.

SEEA analysis would take into account any affected, non-plan area residents who work in the plan area (e.g. in logging, mining exploration, and tourism lodges). The various BC Stats reports on local area economic dependencies are important sources of information about the structure of local area economies.[10]

Each sector presents unique evaluation challenges in terms of cause-effect linkages with changes in land and/or resource management policies, possible adjustments to land use change, and other factors. For example, for all sectors, a key issue to consider is whether alternative, currently unused or underutilised sites or resources are available. Therefore, the most significant effect of a resource management initiative or scenario, even one which precludes such uses at certain sites, may be the costs incurred by operators to relocate the activity to alternative sites and potentially the higher operating costs at those sites if they are inferior. Provincial government revenues may also be affected if, for example, the activity is relocated to a site where the value of the resource is different (e.g. sites with lower timber values, lower productivity for botanical forest products, or lower attraction to tourists).

When the linkage between identifiable industry/activity and the land or resource management is unclear or relatively weak, the effect of each management scenario on industry production or revenues can be uncertain. This can also be the case if the management objectives and strategies are “high level” or “strategic” in nature.

Information may exist regarding potential effects, but not necessarily on which effects are most likely. Under such circumstances, it may be preferable to qualitatively describe the likelihood of those potential effects occurring, rather than generating quantified, very uncertain impact estimates.

If quantified production or economic value estimates are generated for impacts on potential, as opposed to existing economic resources, they must be based on transparent and defensible assumptions.

It is also preferable to estimate the most likely effects (as opposed to the maximum potential or minimum possible), and, if necessary, a range of possible outcomes to indicate the nature and extent of uncertainty (the range should be based on technically defensible data and methodology).

3.1.2 Indirect and Induced Jobs and Income

Indirect employment and income (from providing supplies and services to a given sector) and induced employment and income (from the sale of goods and services to direct and indirect employees) play an important economic development role in plan areas and the province. The most accurate way to assess these impacts is through

[10] The economic dependency reports and associated tables are available at: www.bcstats.gov.bc.ca/pubs/econ_dep.asp

surveys, but in practise there frequently is not the time or funding available to carry these out. As an alternative, indirect and induced impacts can be estimated using employment and income multipliers, which provide a measure of the "spin-off" activity associated with direct impacts. However, there are issues relating to using multipliers:

- Multipliers do not reflect the ability of communities to adjust to changes in the economic base.
- Multipliers are linear and as a result do not recognise threshold effects (i.e. at the margin a small change in timber harvest level could either be sufficient to result in a mill closure or have very little impact on employment).
- Economic base multipliers (or impact ratios) are derived from assumptions regarding which sectors are **basic** to a region (driving the local economy by bringing income in from outside) and sectors that are **non-basic** (dependent on local spending of businesses and workers in basic industries), assumptions that are not always valid.
- While multipliers differentiate between indirect impacts (from purchases of goods and services) and induced impacts (from re-spending effects), there is debate about the relevance of including induced impacts in SEEAs of land use plans.
- From a provincial perspective, income changes in one plan area may sometimes represent only the redistribution of base activity between plan areas, with little or no change for the province as a whole. For example, reduced tourism activity in one area due to a new Protected Area may be offset by increased tourism elsewhere.

Guiding Principle
Using economic base multipliers is a cost effective, albeit flawed methodology for estimating the indirect and induced effects of various basic economic sectors on a region and the impacts of changes to these sectors. A more costly alternative would be to survey firms that supply goods and services at the local and regional level and estimate the impacts of those jobs on the communities, as well as any threshold levels that may cause disproportional responses to changes in sector activity levels.

Guiding Principle
Analysts who use economic multipliers are encouraged to acknowledge the limitations associated with them, and where feasible to attempt to test the reasonableness of the indirect and induced impacts using survey methods and local knowledge of the economic sectors. The estimates produced using employment and income multipliers should be viewed as being very approximate.

Assessments of land use plans have used multipliers prepared by BC Stats, following "economic base" methodology. Economic base multipliers estimate employment and income ratios between sectors which are "basic" to a region (e.g. forestry, tourism) and sectors which are "non-basic" (e.g. local retail sectors). The BC Stats models are based largely on Census Labour Force data. The Local Area Model produces multipliers for local areas and for broader regions (LRMP areas, Forest Districts, Health Service Delivery Areas, and Health Authorities). The **BC Input-Output Model (BCIOM)**

produces multipliers for the province as a whole.[11,12] Appendix 9 and Appendix 10 present examples of BC Stats employment and income multipliers.

3.1.3 Potential Jobs and Income

Guiding Principle
The projected implications for existing sectors of the economy may not reflect the potential uses of the land and resources. It is therefore important to attempt to forecast potential future uses of the resources and to recognise the uncertainty inherent in these forecasts. It is also important to forecast how technological and other change may affect existing jobs and activities (e.g. more environmentally sensitive logging may increase jobs per m³ of timber harvested, whereas more capital intensive wood manufacturing may reduce jobs per m³ of timber processed).

A management scenario may affect future potential, rather than existing activities in, for example, forestry, tourism, or aquaculture. This is particularly relevant with respect to the "hidden" resources of minerals and petroleum. For these and other potentially viable resources, we ask that analysts attempt to explicitly address, either quantitatively or qualitatively, the extent to which the management scenarios affect the probability and timing of possible developments, relative to the base case scenario.[13]

To recognise the forecasting difficulties, ranges of possible outcomes may be used to help indicate the nature and extent of uncertainty. Difficulties in imagining and estimating future resource uses may bias the assessment of management plan impacts in favour of current economic activity. For example, the "economic base" models used to determine economic dependencies for a region may result the mining industry being deemed insignificant in a plan area, when in fact the region has significant mineral potential but no producing mines or substantive exploration activity. The SEEAs completed to date have made extensive use of GIS indicators to show the potential of sectors such as tourism, mining and oil and gas, that may not have a large (or any) current impact in a given plan area.

To the extent possible, SEEAs should quantify potential socio-economic contributions that may reasonably be expected from potential economic sectors or activities.

[11] Other data sources used by BC Stats to construct the local area dependencies (in addition to Census data) include Tourism BC's Visitor Survey, the BC Input-Output Model, Statistics Canada's Survey of Household Spending, and Canada Revenue Agency tax filer information.

[12] The various local area economic dependency tables are available at: www.bcstats.gov.bc.ca/pubs/econ_dep.asp

[13] Forecasting is difficult for certain minerals and oil and gas, particularly when an area has not been comprehensively explored. Another consideration is that technological changes have been known to reveal new opportunities in areas that had been previously explored using old technologies (for example, diamond exploration).

3.2 Provincial Government Finances

Guiding Principle
The evaluation of impacts of each land and/or resource management scenario on provincial government finances includes:

- **estimating the implications for provincial government revenues;**
- **estimating the implications for provincial government expenditures; and**
- **calculating the net financial effect on the provincial government.**

The evaluation of implications for provincial government finances documents the impacts of each land and/or resource management scenario on government revenues and expenditures. These impacts can be presented in a separate section on "provincial government finances" or discussed for each sector (e.g. forestry, tourism) as part of the "Economic Development" impact category. These steps are described below.

3.2.1 Revenue Effects

Provincial resource-related revenues will be directly affected by impacts on resource use. To quantify revenue effects, the change in resource activity should be multiplied by the resource revenues generated per unit of activity (current and projected future activity). The resource revenue generated in different sectors is described below.

Forestry – The British Columbia government collects stumpage revenues from timber logged on provincial Crown lands. The impact on stumpage revenues should be estimated per cubic metre of timber and multiplied by the projected plan impacts on timber harvest volumes over time.

- A forecast of stumpage rates will be required, which corresponds to the period of timber harvest changes (e.g. the next decade). Usually, a forecast rate will be arrived at by averaging historical stumpage rates over a representative time period, such as a forest sector business cycle (usually between 5 and 7 years). Other factors affecting the stumpage rate outlook may also be considered. For example, the introduction in 2004 of the Market Pricing System for the British Columbia coast may reduce the relevance of historical rates in projecting future stumpage revenues for that region. Similarly, changing species and grade composition of the harvest may mean future rates are likely to differ considerably from those in the past.

- Average stumpage values for the plan area over a representative period should be used, unless the analyst has better information on the timber values that might be affected. For example, if data show that a proposed protected area contains mostly pulp wood that would have a stumpage rate of $0.25 / m^3, it would be inaccurate to use a plan area average rate that is largely based on higher quality timber.

Minerals and Petroleum – In the case of sub-surface resources, resource taxes, royalties, and/or bonus bids are paid to the provincial government for production and/or use of land, and the impact is calculated by multiplying the estimated impact on sub-surface resource activity from a management scenario by the applicable rates. Taxes and royalties over at least one business cycle should be taken into account, provided that provincial government policies have remained relatively unchanged.

Tourism – Provincial revenues related to tourism usually comprise lease charges and fees for use of Crown lands or other resources by tourism operators.[14] To calculate the effect on provincial government revenues, the resource tax or lease component should be estimated and multiplied by the estimated effect of the plan or management scenario on tourism spending/tourism revenues in the plan area. We note that if a tourism operator offering accommodation is dependent on access to a resource, then the hotel tax paid may be considered a tax related to access to that resource.

Recreation – With respect to recreation, fees are charged for certain activities (e.g. provincial park use and guided angler days) and the estimated impacts on such activities, if they can be estimated, should be multiplied by the relevant charges to calculate the recreation-related revenue effects. Also to be considered are provincial government revenues from trapping, hunting, and angling licences.

Other Comments

- The cause-effect linkage between strategic-level land and/or resource management changes and resource tax revenues is usually clearest for forestry activity, for which the changes in volume and timing can often be quantified. For many other sectors, such as mining, petroleum resources, tourism and recreation activity, the impacts (either positive or negative) are often on future potential rather than existing activities, the likelihood and timing of which tend to be much more uncertain. Thus, when estimating impacts for non-forestry sectors, the timing and probability of the impacts should be explicitly addressed, at least in qualitative terms, and discounted appropriately if quantified.

- Provincial government revenues can also be affected by general corporate and personal income and sales tax effects of the land and/or resource management initiatives. These are more difficult to estimate than the direct resource-related impacts, particularly over the medium to long term. Also, such effects may not be incremental if capital and labour affected by the resource management initiatives are likely to be employed elsewhere in the provincial economy, or if government expenditures are also influenced in the same direction. Taking income taxes as an example, an anticipated population outflow from the province due to job loss would not only result in lower personal income tax collection, but should also result in lower government expenditures on local services; and/or those losing jobs in the plan area could find jobs elsewhere in the province. Both factors imply that the actual incremental changes in income taxes would be difficult to identify. For these reasons, the recommended approach to estimating provincial government revenues does not focus on these general economic activity-related impacts, but rather on the resource-related effects. If general income and sales tax revenues are estimated, they should be clearly distinguished from resource-related revenue effects, and the issue of incrementality addressed.

[14] The provincial government would also receive revenues in cases where Crown land is sold for a tourism project.

3.2.2 Expenditure Effects

Provincial government expenditures can be directly affected by changes in resource management expenditures or obligations (e.g. compensation requirements, restoration and remediation costs). The magnitude of these effects will depend on the effects on the resource activity and the characteristics of each management scenario (e.g. the location and area of land base excluded from resource extraction, the nature of the management strategies, or increased social services costs related to employment losses). Consultation with resource specialists will be required to estimate these expenditure effects.

The effects on provincial government expenditures should only include those expenditures that are directly and incrementally affected by the land use or resource management plan.

3.2.3 Net Financial Effects

This step involves adding the (positive or negative) estimated revenue effects and the (positive or negative) estimated expenditure, to obtain an estimate of the net effect on provincial government finances.

For example, suppose that reduced logging under a land use plan meant that the provincial government would obtain an estimated $5 million/year less in stumpage revenue than under the base case. Further, there may be resulting unemployment of forest workers that results in $500,000 more in annual social assistance from the provincial government. For the provincial government, the net financial effect would then be an annual loss of $5.5 million. This example could be developed further to consider possibly offsetting increases in tourism activity and employment as a result of the land use plan.

The results of the “net financial effect” calculation can be reported on an average annual basis. If estimates cover an extended period of time, the **net present value** of the annual effects should also be calculated. A range of discount rates should be employed to test the sensitivity of the net financial effect to the choice of discount rate. Net present value is a one-time, “lump sum” estimate, the significance of which may be difficult to gauge relative to other impact indicators such as employment and income, which are estimated on an annual basis. To address this, the discounted net revenue impact could also be represented as annualised or levelised values, the sum of which would be equivalent to the net present value. Both overall and per capita or per household estimates could be reported, to improve clarity.

Net present value calculations are not required if all effects are presented as a constant stream of annual revenues or costs.

3.3 Social Implications

The evaluation of social impacts requires consideration of the concerns and objectives of each community, and how these may be affected by land and/or resource management plans. The assessment follows three steps.

- Pre-assessment research and potential discussion with affected communities regarding their community objectives and concerns.
- Estimating the impacts of land and/or resource management plans on community objectives and identified values.
- Assessing the nature and significance of the impacts.

In general, the economic or environmental effects combined with the nature of the communities in the plan area will be key drivers of any social impacts. Some potential social parameters to be investigated are listed below.

- **Population Impacts:** The impact on population will depend primarily on the estimated employment effects of the land and/or resource management initiatives on plan area workers/residents.

  Multiplying the gross employment effects by an average family size per employee provides an initial estimate of how population change in the area may be affected by changing economic opportunities. However, the actual population change in response to a decline in economic opportunities will depend on factors such as industry, worker and community adjustments to the initial impact, alternative employment opportunities, age structure, quality of life/attachment to the area, and family characteristics that influence population stability. The more stable the population and the larger the community, the less significant is the likely impact.

- **Number of Jobs, Income Levels and Distribution of Opportunities:** Key indicators of social wellbeing include the number of jobs, income levels, and distribution of job opportunities held by local residents. The distribution of job opportunities may be important to local communities in situations where one economic sector, say tourism, offers a greater share of job opportunities to local residents (albeit at lower wage levels) than, say, mining. There may also be other personal and traditional values associated with employment that may make certain jobs more appealing to the local workforce or to a specific population group, such as aboriginal people or women.

- **Recreation and Environmental Impacts with Community Implications:** The use of Crown lands and related resources for recreational purposes, potable water and food harvests are important values to communities. Assessment of impacts on these values should involve the identification of how resources are currently used for non-commercial purposes (e.g. recreation, food, domestic water) and the anticipated trends for such uses in the future. Usage can be quantified in such terms as recreational days by type of activity, level of harvest (e.g. mushrooms, berries) and number of persons or households directly dependent on water or other resources. Discussions with community representatives and local officials will also be an important source of information for determining these values.

- **Local Government Impacts:** The principal impacts on local government are related to taxes and other revenues, since these affect the availability and feasibility of maintaining local government services. These primarily involve local industrial property taxes, which should be estimated when the impacts expected from a plan affect a significant portion of the local industrial tax base. The impact on the residential tax base will only be relevant if the out-migration of a large portion of the workforce in a community is expected.

For impacts such as population, jobs, income levels and tax effects, quantitative impact measures can be estimated, focusing on the most likely effects. For most other concerns, (e.g. impacts on community goals), qualitative assessments based on relevant indicators identified in the pre-evaluation assessment will be required.

Social assessments of land and/or resource management initiatives can use a variety of indicators to demonstrate the impacts of these initiatives on community sustainability or well being. A recent example of the use of indicators for demonstrating community sustainability was developed by Natural Resources Canada in 2004 as part of the Morice & Lakes Innovative Forest Practices Agreement (IFPA).[15] The main categories of indicators in that framework include:

- human capital (e.g. education, schools)
- economic capital (e.g. employment, taxes)
- social capital (e.g. community volunteers)
- ecological integrity
- economic vitality (e.g. economic diversity, income leakages, unemployment, entrepreneurship)
- civic vitality (e.g. local governance, physical and mental health and recreational opportunities)

The significance of the social impacts should be based on the estimated magnitude (or qualitative indication) of impact, and the importance of the issue or objective to the affected communities (e.g. population or tax base impacts as a proportion of the total).

As much as possible, the analysis should also reflect how the affected communities view the likely effects. This would likely require initial discussions with community members, and follow-up discussions after the impacts of the land use plan or resource management scenarios have been assessed in draft form.

Finally, we note that aboriginal people use Crown land for traditional, cultural, and subsistence purposes, and that therefore a separate assessment of specific aboriginal implications is required. This is discussed in the following section.

[15] Natural Resources Canada, Canadian Forest Service (Norah MacKendrick and John R. Parkins, *Indicators of Community Sustainability for the Morice and Lakes IFPA Region*, prepared for the Morice & Lakes Innovative Forest practices Agreement (IFPA), January 2004.
www.for.gov.bc.ca/hfd/library/FIA/2004/FIA-04-05-0072.pdf

3.4 Specific Aboriginal Implications

Guiding Principle
Aboriginal communities and non-aboriginal communities use many of the same land based resources in a plan area, e.g. wildlife, fisheries, and forests. To the extent that aboriginal concerns are similar to those of non-aboriginal communities, they could be discussed in the assessments dealing with economic development, social implications, and Net Economic Value.

Guiding Principle
Aboriginal circumstances are often quite different than those of the rest of the population. In those cases, specific aboriginal values should be discussed separately, in an assessment of "Specific Aboriginal Implications". For example, aboriginal communities have strong attachments to the land from economic, cultural, traditional, and spiritual perspectives, and there may be specific aboriginal concerns that are not addressed in the other impact categories – such as cultural heritage, traditional use, and botanical forest product sites.

The steps in assessing specific aboriginal implications should include:

- **Pre-assessment:** Discussion with the affected aboriginal communities is recommended, to define issues of concern, to help identify data and information sources in the community, and to gain community support for the evaluation process. Discussions with aboriginal leaders and representatives are an integral part of the land and/or resource management planning process, and SEEA consultants typically rely on provincial government staff to arrange and establish discussions with the aboriginal communities in a plan area.
- **Identifying resource use by aboriginal communities:** This step identifies the potential impact on aboriginal communities which use resources in the plan area for commercial, cultural and traditional purposes. A clear understanding of those uses and their significance is required. The primary sources of this information include:

  (1) discussion with aboriginal community leaders, elders and band managers; and

  (2) maps identifying key resource values on lands for purposes of GIS analysis.

  Collection of primary data from aboriginal groups may be facilitated by provincial government technical staff.

  The type of GIS mapping that can be generated to express resource values important to aboriginal communities include the Archaeological Overview Assessment (AOA) data, which determines the archaeology resource potential of an area. Other GIS data may also include existing archaeological sites, kilometres of trail, traditional use sites, and other data as may be available from provincial government technical staff and the local aboriginal communities in the plan area. Obtaining data on specific archaeological or traditional use sites may require information-sharing protocols with aboriginal communities, which could be facilitated by provincial government technical staff.
- **Estimating the nature and extent of impacts on aboriginal communities:** This step documents the effects on the resources on which the aboriginal communities depend (e.g. impacts on resource extraction activities, wildlife, fisheries, botanical

values, and archaeological sites) and then estimates how those resource impacts may affect aboriginal communities. These impacts may be qualitative (e.g. improvements in land and resource management or effects on culturally important lands), or quantitative (e.g. estimated effect on food harvests). Discussions with representatives of the affected communities at the draft report stage are recommended.

- **Assessing the significance of the impacts:** The significance of the impacts should be assessed in terms of their magnitude and importance to the affected aboriginal communities and should reflect community views. To repeat, discussions with representatives of the affected communities at the draft report stage are recommended.

In conducting an assessment of aboriginal implications, SEEA analysts are advised to review the *Resource Analysis Guide*, which discusses the data requirements and data sources for assessing the impacts of management direction changes on cultural heritage resources (including archaeological resources).[16]

3.5 Net Economic Value

Net Economic Value (also called **"economic rent"** or "resource rent") is used to measure the economic efficiency of various resource uses. An economically efficient land and/or resource use plan would maximise the total net value of plan area resources, through the efficient allocation of those resources to various uses (e.g. forestry, mineral development, agriculture, tourism, recreation, wildlife habitat, **biodiversity** preservation, carbon values). In theory, given perfect information on the net economic values generated by each potential use, and the degrees of compatibility of all potential combinations of uses, one might be able to determine an economically optimal allocation of resources.

In practice, perfect information is not available. Nevertheless, any information that the socio-economic analyst is able to provide on the Net Economic Value of potential resource uses, and any (even qualitative) indications of the compatibility of different potential uses, is useful to the assessment.

If Net Economic Value and economic efficiency are not considered, the result may be a focus only on social or economic development impacts (jobs and income), which are primarily concerned with the distribution of costs and benefits, rather than overall changes in economic welfare. This can lead to erroneous conclusions regarding the most desirable use of lands and resources. For example, logging uneconomic timber generates employment for forest sector workers but results in minimal or no economic rents paid in the form of stumpage to the Crown. Logging of uneconomic timber is typically unjustifiable on economic efficiency grounds, particularly if it also involves negative "externalities", such as reducing recreation opportunities and wildlife habitat.

[16] The *Resource Analysis Guide for Sustainable Resource Management Planning* can be accessed at: http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background/rag

Estimating Net Economic Value requires assessment of the economic rents generated by commercial sectors, as well as those related to the non-commercial goods and services provided by plan area resources such as recreation and environmental values. Economic rent is the "surplus" that remains after all the costs of undertaking an activity have been covered. Economic rents would be generated, for example, in timber production if the price of the timber exceeds all the costs of production, or in recreation if recreationists obtain greater value from their activities than the costs incurred.

The key steps in estimating Net Economic Value include:

- Determining which commercial and non-commercial resource based sectors to include in the analysis.
- Developing or compiling estimates of economic rent generated by each resource sector included in the analysis.
- Applying the economic rent estimates to the corresponding resource impacts and summing them to determine the total annual effects.
- Discounting and summing the annual effects to determine the total net present value effect and average annual effects on Net Economic Value (except where the impacts are presented as a constant stream of annual net revenues).

Methodologies for assessing Net Economic Value generated by commercial and non-commercial uses, and guidelines regarding discount rates are presented below. Specific sectors are further discussed in Appendix 11.

3.5.1 Commercial Resource Uses

Guiding Principle

For commercial sectors, Net Economic Value (or economic rent) is defined as the above-normal financial returns from a commercial activity that occur as a result of the product or service generated by that activity being in relatively fixed supply relative to demand. Economic rent can accrue to the entrepreneur, be captured by the land and/or resource owner (government) or be incorporated in wages paid to labour. Economic rents may be estimated as the total sales revenues (generally pre-tax) less all private and public costs of production, plus any portion of costs which are over and above the minimum payment required to attract and employ any of the factors of production (e.g. labour).

The economic rent measure should also be net of any external costs imposed upon third parties (e.g. environmental or social disturbances). However, in practise externalities can be difficult to monetise. We suggest that, at a minimum, the SEEA compare calculated rents with any associated environmental and social disturbances, to evaluate the degrees of co-existence achievable through alternate resource management scenarios.

Measures of Net Economic Value generated by commercial resource uses may consider the following:

- **Public Sector Rent**: Provincial government resource tax revenues are designed to capture economic rents, and as a result they can be used to reflect the economic rents for the commercial use of Crown resources. This includes, for example, stumpage revenues from the forest industry, and oil and gas royalties and bonus bids in the case of the petroleum industry. In these instances, the provincial government resource tax revenues are assumed to reflect product market prices less production costs (including a reasonable return on capital).
- **Rent Captured By Labour**: Rent may accrue to labour, due to various labour market rigidities and "imperfections" which result in higher wages than would otherwise occur in competitive labour markets. This could occur in unionised sectors. Because rent accruing to labour may be very difficult to estimate, we suggest approximating it with some fixed percentage of total direct labour costs for each sector, for example 5% of total labour costs.
- **Private Sector Rent Captured By Owners of Capital**: Rent may accrue to entrepreneurs who own or employ factors of production that are in relatively fixed supply, for example timber resources or access to key recreational or tourism features. These rents are also very difficult to estimate, and we suggest estimating them using a percentage of sales revenues, at least for sectors where profitability is unknown.

Appendix 11 provides examples of how an analyst might estimate the Net Economic Value for the forestry, mining, agriculture and tourism sectors, with a brief description of the rationale for the estimates.

The assessment of Net Economic Value should also include some recognition of the potential economic rents that may accrue from commercial activities that are not currently occurring in the plan area, but that might reasonably be expected to take place in the future. For example, an area with significant oil and gas potential should likely recognise the potential oil and gas royalties that may be expected from the development of those resources, and the potential loss or gain in future royalties that may result from reducing or increasing access to the resources.

We suggest that analysts estimate the most likely impact of each scenario on the Net Economic Value of each commercial sector, and possibly also include a range of plausible outcomes to demonstrate the level of uncertainty associated with the estimates.

3.5.2 Non-Commercial Resource Uses and Non-Use Values

The benefits associated with non-commercial activities, such as recreation, and the benefits associated with environmental resources, fall into two categories: use-related values and non-use values.[17]

- **Use-related values** result from the direct consumption or use of the resource, such as through amenity values (e.g. recreation), or ecosystem goods and services (e.g. clean water, soil formation, carbon sequestration, and wildlife habitat).

- **Non-use values**, sometimes referred to as "preservation" or "passive use" values, consist of three types: option values (benefits of maintaining the possibility of future use), **existence values** (benefits from simply knowing that an environmental attribute exists) and bequest values (benefits from knowing that an environmental attribute can be available to future generations).

Valuation Methods

Methods for estimating associated Net Economic Value include:

- **Revealed preference methods**, such as travel cost models, hedonic pricing models, and market value or avoided cost approaches (e.g. clean up costs, value of changing health risks), through which economic valuations are inferred indirectly by observing individuals' behaviour in actual or simulated markets.
- **Stated preference methods**, such as contingent valuation surveys and choice experiments, through which economic valuations of environmental goods and services are elicited directly from individuals by asking them about their preferences.[18]
- **"Value transfer" approaches**, which use economic valuations obtained in original research in other jurisdictions or from studies undertaken for other purposes.[19]

We suggest that analysts be careful to avoid double-counting across the various kinds of resource value.

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[17] See *The Economic Benefits of Protected Areas: A Guide for Estimating Personal Benefits*, by The Outspan Group for the Department of Canadian Heritage, May 2000.

[18] See, for example, Boxall P.C., Adamowicz W.L, Swait J., Williams M., and Louviere J., "A comparison of stated preference methods for environmental valuation", *Ecological Economics*, Volume 18, Number 3, September 1996, pp. 243-253.
www.ingentaconnect.com/content/els/09218009/1996/00000018/00000003/art00039#avail

[19] Environment Canada's Environmental Valuation Reference Inventory (EVRI) is a searchable storehouse of empirical studies on the economic value of environmental benefits and human health effects. It has been developed as a tool to help policy analysts use the benefits transfer approach. Canadian residents can subscribe at no charge.
www.evri.ec.gc.ca

Examples of applications related to land use planning include:

- In the case of recreation, estimates of willingness-to-pay for comparable types of activities in comparable locations could be used (example provided in Appendix 2-8).
- In the case of non-commercial food use or water use, the cost of alternative supplies can be used to impute willingness-to-pay.
- For fish/wildlife values, existing surveys that quantify the willingness-to-pay for incremental populations or use could be used. Existence or option values of fish/wildlife populations could also be taken into account, although the incremental effects of management scenarios on non-user values for specific resource values may be very difficult to estimate. More generalised estimates of society's existence/option values for management regimes that provide greater protection for **wilderness** and ecological values can also be employed.[20]

Time and budget constraints may preclude undertaking original survey research on the value of non-commercial activities for most planning exercises. If so, the extent of the assessment of Net Economic Value associated with non-commercial activities would depend on the availability of economic value estimates for the plan area, transferable economic value estimates from other studies, practical experience with valuation methods, and the significance of the related activities in the plan area.[21]

We encourage the application, to the extent possible, of the valuation techniques discussed above, while appreciating that this may be limited by data and conceptual difficulties, and that there also may not be a clear indication of the extent to which the uses would be affected by the land use plan or management scenarios.

An Alternative: "Threshold" Values

As an alternative to attempting to estimate Net Economic Value for all resource uses affected by scenarios, some insight into the economic value of non-commercial resources could be gained by instead considering commercial impacts as "threshold" or "critical" values. For example, to increase social welfare, the non-quantifiable environmental benefits of a particular management scenario would have to be equal to or greater than the net present value of estimated commercial timber and sub-surface Net Economic Value forgone in that scenario. Annualised or levelised estimates of threshold values per capita or per household (which could be considered as an annual tax levy) might provide an indication of the willingness-to-pay for, or opportunity cost of, greater protection of non-commercial values.

Guiding Principle

While there are difficulties in estimating Net Economic Value associated with non-commercial activities, analysts are encouraged to estimate what can be monetised, and at a minimum to explicitly assess how large the net present value of the non-quantifiable benefits would need to be to change the relative attractiveness of the land / resource management plan or initiative.

[20] As an example, see *The Economic Value of Wildlife Activities in BC, 1996*, by Roger Reid for the BC Ministry of Environment, Lands and Parks, 1998.

[21] For an in-depth discussion of the valuation of ecosystem goods and services, see Tom Green's report, *Accounting for old forests: a methodology for assessing the economic benefits of retaining old forests in BC*, for Biodiversity Branch, BC Ministry of Water, Land and Air Protection, 2002. http://wlapwww.gov.bc.ca/wld/documents/techpub/Green_Valuation_Old_Forest_BC_Vol_I.pdf

As the Net Economic Value associated with certain resource sectors and values may not be evaluated due to data limitations (e.g. non-commercial values), it is important to indicate which sectors are included or excluded in the estimates and whether any exclusions would increase or decrease the estimated effect. Also, to indicate the impact of uncertainties, the analyst could identify a range of plausible outcomes and which one is considered "most likely".

3.5.3 Natural Capital

The use and non-use values discussed above derive from the ecosystem services provided by "natural capital", an indicator for which frameworks and data sources are being developed elsewhere.[22,23] Although as yet we have little experience with the natural capital indicator, we encourage analysts to consider its practical application in the context of land and resource management planning, with a view to improving the quality of information provided in the SEEA reports.[24]

3.5.4 Discount Rates and Net Present Values

The assessment of Net Economic Value may require net present value (NPV) calculations using discount rates, to recognise the timing of benefits and costs.

Guiding Principle
In determining appropriate discount rates, there is a need to differentiate between the social opportunity cost of capital and the rate of social time preference. The social opportunity cost of capital (based on long term borrowing costs less the expected long term inflation rate) is appropriate for NPV calculations of industry revenues and other economic values. The rate of social time preference is appropriate for NPV calculations of environmental or social impacts.

There are differences of opinion regarding which discount rates are appropriate in each situation. As a result, we suggest that NPV calculations include sensitivity analysis to demonstrate the effect on calculated values of employing alternate discount rates.

Estimates of Net Economic Value are subject to significant risk and uncertainty. We suggest that this be taken into account by estimating the "most likely" impact of each scenario, with a range of plausible outcomes to illustrate the associated levels of risk and uncertainty (rather than using risk-adjusted discount rates).

NPV calculations are not required if impacts are presented as a constant stream of annual revenues or costs.

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[22] For a general discussion of natural capital and valuation of ecosystem services, see Nancy Olewiler (2004). *"The Value of Natural Capital in Settled Areas of Canada"*. Published by Ducks Unlimited Canada and the Nature Conservancy of Canada. 36 pp. The report can be accessed at: www.ducks.ca/aboutduc/news/archives/pdf/ncapital.pdf

[23] See also Peter Pearse's essay for the National Round Table on Environment and Economy, *From Testing to Mainstream Adoption: The NRTEE's Proposed Approach to Indicators*, at: www.nrtee-trnee.ca/eng/programs/Current_Programs/SDIndicators/Activities/20010327_IndicatorsConference/Presentations/Pearse_20010327_SpeakingNotes_e.htm

[24] With respect to land use planning in BC, natural capital is discussed briefly in Section 6.6 (p. 77) of *Socio-Economic and Environmental Assessment of LRMP Scenario Developed by the North Coast LRMP Table as of April 2004* (Crane Management Consultants et al, 2004). The report is available at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis/projects_pubs

3.6 Environmental Assessment

The Environmental Risk Assessment (ERA) is typically undertaken separately from the Socio-Economic Assessment (SEA), often by a Registered Professional Biologist familiar with current standards and methodologies. The SEA and the ERA are usually subsequently combined as a Socio-Economic and Environmental Assessment (SEEA) to help demonstrate the implications, trade-offs, and possible solutions involved in land and/or resource management decisions. This section provides an overview of the risk assessment approach for the evaluation of the environmental implications, and suggestions for integrating the SEA and the ERA.

Note: The term "values" is used in this section to refer to "attributes" or "indicators", as distinct from the discussion of "economic values" in previous sections.

3.4.1 Environmental Risk Assessment

Guiding Principle

We recommend a risk assessment approach for the evaluation of environmental implications. Risk is defined as "the probability of an adverse event occurring," such as a decrease in wildlife habitat and populations. This ERA approach is outlined in the following two documents:[25]

- *Environmental Risk Assessment: An Approach for Assessing and Reporting on Environmental Conditions*, Ministry of Environment, Lands and Parks (2000)
- *Environmental Risk Assessment: An Introduction, With Examples From Haida Gwaii/QCI*, R. Holt (2006)

The ERA procedure involves several steps, including:

- Identifying the appropriate environmental indicators.[26]
- Characterising trends in those indicators through time.
- Establishing benchmarks against which to understand the significance of the trends through time, and where possible identifying low and high risk thresholds to categorise the significance of changes.
- Assessing whether the base case and the land use plan scenarios are adequate to maintain ecological integrity over the long term. This is usually done by comparing them with a benchmark approximating "natural conditions".
- Presenting results and identifying key assumptions and uncertainties so that decisions can be made with full knowledge of the potential environmental implications, and so that adaptive management processes can test the hypotheses being generated.

[25] These documents can be accessed at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis
[26] Environmental values of local, provincial, national, and international significance should be identified and the impacts on them assessed. The choice of appropriate indicators is discussed in R. Holt (2006).

3.6.1 Base Case Environmental Values and Key Indicators

The ERA Base Case is also discussed in Appendix 2.

To assist with identifying environmental values and key indicators, we suggest that analysts review published literature and government reports, and consult with stakeholders and resource agencies, primarily with the BC Ministry of Environment, the Ministry of Agriculture and Lands (Integrated Land Management Bureau), and the Ministry of Forests and Range.

To facilitate the description and assessment of impacts, indicators or ecological integrity are required. A well-accepted approach is to use "coarse filter" and "fine filter" approach in selecting indicators, as described in Holt (2006):

- **Coarse Filter Indicators:** The coarse filter focuses on ecosystem elements that provide for the vast majority of species. This can include:
  - representing ecosystems across the landscape;
  - using umbrella or wide-ranging species which have habitat that potentially also provides habitat for a wide array of other species;
  - using keystone species (those that have a disproportionately higher ecological role than is suggested by their biomass); and
  - using indicator species which are sensitive and require a broad set of ecosystem elements.

- **Fine Filter Indicators:** The fine filter approach identifies special elements that are likely to not be maintained by the coarse filter, including key ecosystem processes and rare species or habitats in the plan area, such as red and **blue-listed** plants, plant communities, and animals.[27] Those species that are targeted by provincial or federal legislation would also be included.[28]

Appendix 4 discusses sources of information and relevant data.

3.6.2 Linkages Between Land, Resources and Environmental Values

The risk assessment should explicitly identify the cause-effect linkages between land and/or resource management and biodiversity or specific species. In general, assumptions should be drawn from the scientific literature in various disciplines, in particular conservation biology as it relates to changes in land and/or resource management initiatives. However, local knowledge and professional judgement are also important. Ideally, assumptions would be continuously assessed through

[27] See BC Species and Ecosystems Explorer at: http://srmapps.gov.bc.ca/apps/eswp
[28] These would include:
- species listed on *Species at Risk Act (Sch. 1)*
- species listed under the *Wildlife Act*, www.qp.gov.bc.ca/statreg/reg/W/Wildlife/168_90.htm
- species at risk under the *Forest and Range Practices Act* (FRPA) www.env.gov.bc.ca/wld/frpa

monitoring and further scientific investigation within an adaptive management framework.

The following table lists some assumptions that have been used in the environmental assessments of land use and resource management plans in British Columbia.

Table 3. Environmental Assessment Assumptions

The more closely managed forests and landscapes resemble natural (i.e. without major influence by humans) forests and landscapes, the greater the probability that populations of all native species will be maintained.
Risks to biodiversity increase with increasing departure from natural stand and landscape structure.
Protected areas that are large (>1000 km^2) or are connected to other protected areas generally protect more environmental values than do smaller or more isolated areas.
Higher road densities (km/km^2) increase mortality risk for certain species (e.g. Grizzly Bears). Road development fragments habitat, increases sedimentation rates in streams, and increases mortality risk to fish.

3.6.3 Ecological Risks

In order to interpret the analysis in terms of the potential to maintain ecological integrity (or conversely, the probability that ecological integrity will not be maintained), an appropriate ecological "low risk" benchmark should be identified.

The ERA approach defines a low risk benchmark as "conditions with a high probability of sustaining environmental values over the long term". For forested areas, defining this benchmark helps to identify what landscape and stand-level attributes need to be maintained, and also highlights the linkages between environmental threats or pressures and potential impacts. The low risk benchmark should be based on scientifically and biologically sound principles. If possible, critical thresholds should also be identified to help determine the levels at which the probability of maintaining specific environmental values and services diminishes significantly.

A risk level scale should be established. Recent ERA reports[29] have used a five risk class approach (Very Low, Low, Moderate, High and Very High). The ERA approach suggests using five risk classes (Very Low, Low, Moderate, High and Very High). Ideally, each risk class would be defined to reflect not only a certain probability or likelihood of an undesirable outcome, but also to reflect the relative magnitude of an impact.[30] For example, a high risk could be defined as "a high likelihood that a species habitat/population will decline by 50% over the next 25 years".

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[29] For example, Holt, R.F. 2004. *Environmental Conditions Report for the Haida Gwaii / Queen Charlotte Islands Land Use Plan*. Available at: http://ilmbwww.gov.bc.ca/ilmb/lup/lrmp/coast/qci/hgqci_env

[30] See *Risk Management and Statutory Decision Making Handbook* (Ministry of Forests, 1998) www.for.gov.bc.ca/hen/publications/risk_manage/risk_manage_chapter01.html

3.6.4 Assessment of Scenarios

An assessment of the implications of alternative land use and/or resource management regimes for risk levels to environmental values would consider the following factors:

- How much of the resource value will be directly and indirectly affected spatially.
- The duration of potential effects (i.e. short/long term).
- The likelihood (certain/possible/unlikely) that an adverse event could occur.
- The ability (high/low) for the resource value to resist or recover from human disturbance (resistance and resilience).

Potential cumulative environmental effects (CEE) in the plan area as well as adjacent lands should be addressed when assessing relative risk levels. This also recognises that some ecological processes occur at larger spatial scales than within a particular plan area boundary (e.g. hydrological function, predator-prey relationships).

Any mitigation strategies recommended by the management scenario (e.g. access control points, seasonal restrictions on industrial activity), should also be taken into account in establishing the risk rating. Such strategies should also be taken into account, as appropriate, when establishing risk ratings for the base case or other scenarios, depending on the management regime contained in those scenarios.

Analysis Tools
A range of analytical tools can help decision-makers evaluate environmental impacts. The predominant approach used in most strategic land and resource management assessments to date has followed the Integrated Land Management Bureau's *Resource Analysis Guide*,[31] which uses GIS area analysis to illustrate how various mapped environmental indicators (e.g. wildlife habitat) are distributed across resource management zone categories. Although the data for this approach is readily available, the availability of habitat over time can only be inferred, reducing its utility for risk assessment. Habitat supply models, particularly those that are spatially explicit, can project habitat availability over time, and therefore are very useful for evaluating the relative risks of land and/or resource management plans that have potential long term impacts. Some strategic plans for land and/or resource management have used Spatially Explicit Landscape Event Simulation (SELES) tools to track potential resource development impacts on key landscape attributes over time, and to drive habitat supply models for focal species.

These two analytical tools can be used together. For example, while habitat supply models are explicitly linked to forest development planning, GIS area analysis can identify potential conflicts with non-timber resource development activities (e.g. mining, tourism) and the extent to which key environmental values occur in supportive

[31] See http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background/rag.html

management zones such as Protected Areas. Hence, a combination of both approaches may provide the best information for risk assessment. More information about GIS and habitat supply models is presented in Appendix 12**.**

3.6.5 Economic and Social Aspects of Environmental Implications

The ERA procedure described above relates primarily to ecological implications. A further step is to link the ERA to the social and economic assessments. The social significance of the environmental implications could be discussed in the assessments related to Social Implications and Specific Aboriginal Implications. The economic significance of the impacts could be addressed, at least in qualitative terms, in the assessment of Net Economic Value (see Section 3.5). The following points could be considered:

- Where practical, a monetary value applied to the risk assessment could help to estimate the net benefit associated with each option, using methods such as contingent valuation, value transfer, or costs of rehabilitation/mitigation.

- While attempting to quantify environmental outcomes is important, where quantitative outcomes are too uncertain, an alternative would be to assess how large the net present value of the environmental impacts would need to be to change the relative attractiveness of the land and/or resource management initiative.

- The economic importance of provincially significant environmental implications, including use and non-use benefits, could be addressed, at least in qualitative terms, in the assessment of Net Economic Value.

- In some instances, it may be appropriate to convert the environmental risk assessment to a rating system so that the indicator may be weighted and compared to the indicators in the other impact categories through a **Multi-Attribute Trade-off Analysis** (MATA is discussed in Section 4.4 and defined in the glossary).[32]

3.6.6 Climate Change

Implications related to climate change are a new consideration in British Columbia SEEA guidelines. The presentation here is preliminary, meant to identify the relevant factors and initiate discussion and development of appropriate methodologies. We expect that at this stage analysis may primarily be qualitative.

[32] For an example of the use of MATA in British Columbia, see the RAV *Socio-Economic/Socio-Community Assessment* (Pierce Lefebvre Consulting, December 2004), available at: www.eao.gov.bc.ca/epic/output/documents/p208/d19462/1102716143755_494bf0b1bf6a4bffa19de1d5c320ab0a.pdf MATA has also been used by BC Hydro in aspects of water use planning. See information presented at: www.bchydro.com/environment/wateruse/wateruse30860.html

Climate Change Context [33]

There is international scientific consensus that increased concentrations of greenhouse gases are causing global warming and climate change.[34] Projected changes in climate are expected to bring challenges and benefits to British Columbia. Possible challenges include reduced snow packs, glacial retreat, reduced stream flows and soil moisture, more forest fires and pest outbreaks, loss of some **wetland** and alpine ecosystems, and more frequent and severe drought, high intensity rainfall, flooding, coastal storms and other extreme weather events. Some effects may be beneficial, such as longer growing seasons and the possibility of expanded agriculture in northern regions. These projected changes will have important social, economic, and environmental implications.

Land use plans and resource management initiatives may have implications related to carbon storage, greenhouse gas emissions, and adaptation and risk management. In addition, climate change may affect outcomes intended by land use plans and resource management initiatives.

Carbon Storage and Greenhouse Gas Emissions

Land and resource based industries can be substantial sources of emissions.[35]
For example:

- **Petroleum** – Oil and gas exploration and production can release greenhouse gases through leakage, natural gas flaring, and gas processing facilities.
- **Agriculture** – Agricultural activity can emit greenhouse gases through the burning of fossil fuels, methane produced by livestock, nitrous oxide from fertilisers and manure, and through release, by tillage, of carbon stored in soils.
- **Forestry** – Forestry activity can emit greenhouse gases through fossil fuels used in logging and milling, nitrous oxide emissions from fertilisers, and release of carbon stored in logged timber and forest soils. Fires and pests can also cause release of stored carbon. The conversion of forests to agricultural or other uses is also a source of greenhouse gases. On the other hand, forests remove and store carbon from the atmosphere (sequestration). In general, the older the forest, the greater the amount of carbon it stores.[36] Practices that increase forest growth rates, reduce tree mortality, reduce soil disturbance, suppress fires, and manage nutrients all contribute to carbon storage in forests and soils.[37]

Land use plans and resource management initiatives could increase or decrease

[33] See *Weather, Climate and the Future: B.C.'s Plan* (BC Ministry of Water, Land and Air Protection, December 2004) and other information at: www.env.gov.bc.ca/air/climate
[34] The principal greenhouse gases are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6). Human activities, such as industrial activity, burning fossil fuels, and conversion of forest land to agricultural uses, have significantly increased the atmospheric concentrations of greenhouse gases over the past century.
[35] We note that all industries are taking significant steps to reduce their greenhouse gas emissions.
[36] Kyoto Protocol signatories can decide what forests and forestry activities to include or exclude from the calculations of changes in greenhouse gas emissions relating to their commitments under the protocol.
[37] Carbon is also stored in forest products that eventually decay and emit carbon at varying rates (e.g. wood chips, sawn timber, newsprint, and wood furniture).

carbon emissions and carbon storage through measures such as:

- establishing protected areas where no logging would occur and old forests would be preserved;
- permitting conversion of forest land to other uses; and
- specification of forest management practices such as "Ecosystem-Based Management", which may enable greater carbon storage and fewer carbon emissions.

Adaptation and Risk[38]

Even if global emissions of greenhouse gases were soon to be reduced substantially, some warming and climate change would still occur. In British Columbia, many natural systems, communities, and economic sectors will be affected. Anticipatory adaptation measures could help to lessen the negative impacts of climate change, reduce community vulnerability, and enhance the ability to take advantage of new opportunities.

Land use planning and resource management initiatives may affect the degree of exposure to climate-related risks and/or the capacity to adapt to them. Some illustrative examples include:

- Decisions about the size and location of protected areas could consider the extent to which climate change may affect the ecological values they seek to preserve, and include measures to protect those values.
- Decisions could be made to limit agricultural extension in areas where drought is likely to increase, or which may become much more vulnerable to flooding.
- Forest management decisions could include the possibility of changes in tree species and increased losses to fire and pests.

We recommend that analysts consider the potential impacts of climate change as environmental risk factors. These risks could be assessed in the context of comparing the base case with a land use plan or resource management options. The associated economic and social implications would be considered as outlined in Section 3.6.5, above.[39,40]

[38] See www.env.gov.bc.ca/air/climate/#impactadapt

[39] Carbon emissions reductions are beginning to take on monetary value. The Kyoto Protocol allows the trading of carbon credits, and the 2005 Canadian federal budget discussed transaction values for the purchase of such credits by a proposed Climate Fund. Also, various transactions have taken place in British Columbia, and worldwide various trading platforms for carbon are in active use.

[40] Methodologies have been developed for assessing climate-related risks and response options. For an example, see the Canadian Environmental Assessment Agency's guidance manual *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners,* at: www.ceaa-acee.gc.ca/012/014/0_e.htm

4.0 Communication of Results

The SEEA results must be clearly communicated if they are to effectively assist planners, stakeholders, decision makers and the public. This section examines the following issues relating to the presentation and communication of the socio-economic and environmental impact results:

- integration of socio-economic and environmental assessment results and demonstration of the advantages and disadvantages associated with a land use plan and/or resource management options;
- ways of presenting data and results;
- the extent to which stakeholder preferences should be documented; and
- trade-off analysis.

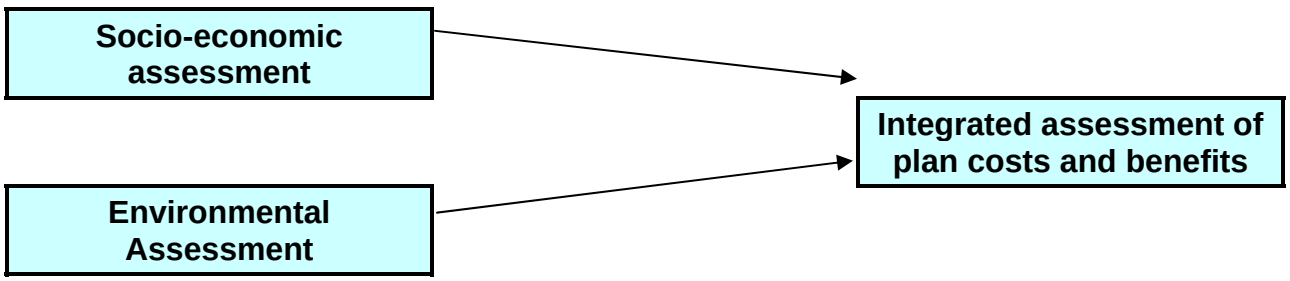
Clear, concise writing and consistent, complete documentation are essential:

- SEEA reports should be written in plain English and be no longer than necessary.
- Relevant information should be referenced in a manner allowing readers to easily refer to source documents. Web-based references are particularly useful.
- Analysis should be transparent and clearly explained, including step-by-step illustrations of calculations.
- Assumptions, methods, and their implications and limitations should be clearly documented, preferably in appendices for that purpose.
- If an SEEA report has been prepared by consultants, the consulting team should be identified and a brief description of their professional work provided (one page or less).

4.1 Integration of Socio-Economic and Environmental Assessments

The socio-economic assessment and the environmental assessment are normally undertaken as separate exercises, since they require different types of data and expertise. However, there is a need to eventually integrate the results of these assessments so that trade-offs and synergies are made explicit.

The purpose of integration is to ensure that planners, decision makers, stakeholders and the public are aware of the full range of costs and benefits in evaluating the final plan. For example, measures to enhance fisheries or wildlife habitat are likely to improve ecological values, and may also enhance recreation and tourism opportunities, but perhaps at a cost to the forest sector.



SEEA reports should explicitly demonstrate the trade-offs between resource values.

This can be done by focusing on the interaction between key socio-economic and environmental drivers in the plan area, rather than presenting them as separate and mutually exclusive. A simple method is to summarise the socio-economic and environmental implications of management zones or objectives in a table in the executive summary for the SEEA. For example, the following table presents the analysis results for both mountain goats (environmental value) and forestry (socio-economic value), allowing a direct comparison.

Table 4. Summarising Evaluation Results

Plan objective	Risk to mountain goat	Risk to viability of forestry operations
Maintain 70% basal area within 50m of mapped mountain goat winter range	Low – moderate Some risk associated with logging in and around goat habitat	Moderate Potential loss of 15,000 m^3 AAC as a result of goat management guidelines
Unless no economically or operationally feasible alternative exists, do not construct roads within 500 m of mapped goat habitat.	Low – moderate Risk to goats is primarily due to poaching, which is not completely eliminated by minimizing roads	Low – moderate Assessment indicates little impact on access to timber as a result of road restrictions.

4.2 Presentation of Findings

SEEAs generate considerable information. To communicate this information in a form meaningful for comparison, we recommend a matrix summarising the key findings. A representation of relative risk levels, especially for environmental values, could also be helpful (including the distribution of risks both geographically and over time).

We suggest that care be taken to present not only quantified results, such as forest sector impacts, but also unquantified outcomes (often in the social and environmental areas) that may be highly significant.

Where several scenarios have been examined, the summary matrix could show how scenarios could be adjusted to mitigate their disadvantages relative to other scenarios, and thus assist in the development of a single, more generally acceptable option. For example, management strategies could be modified, an economic strategy could be developed, policies or programs could be designed to ease the burden on those adversely affected and, timber supply reductions might be deferred to allow time for industry/worker adjustments. Similarly, high environmental risks could be mitigated by alternative management strategies suggested by resource specialists.

Care should be taken to ensure that such mitigation measures are considered for the base case and all other scenarios, to ensure fair comparison of alternatives.

The uncertainty associated with implications should also be documented, as it may indicate the need for caution in the selection of a preferred management direction, or the need for further analysis of the scenarios before a consensus can be reached.

A sample summary matrix template is shown in Table 5, below. An example of the use of a summary matrix can be found in the executive summary of the SEEA report for the Morice LRMP Table Recommendations.[41]

Table 5. Summary Matrix Template

	Base Case	Land Use Plan
Economic Development		
Forestry	•	•
Tourism and Recreation	•	•
Minerals and Energy	•	•
Agriculture, Trapping, Botanical Forest Products	•	•
Provincial Government Finances		
Revenues	•	•
Stumpage	•	•
Resource Royalties	•	•
Expenditures	•	•
Health, Education, Social Services	•	•
Other	•	•
Social Implications		
Community Resilience	•	•
Economic Diversification and Stability	•	•
Governance	•	•
Ecological Integrity	•	•
Cultural/historical and archaeological issues	•	•
Local access to food gathering, botanical forest products, fishing and hunting	•	•
Specific Aboriginal Implications		
Management/protection of areas of identified aboriginal values	•	•
Watersheds of concern	•	•
Cultural / archaeological issues	•	•
Access to food gathering, hunting and fishing	•	•
Trapping values	•	•
Other issues identified by aboriginal communities	•	•
Net Economic Value		
Commercial Sectors	•	•
Non-Commercial Uses	•	•
Non-Use Values	•	•
Environment		
Proposed Protected Areas	•	•
Ecosystem Representation - Old Forest Within Landscapes	•	•
Early and Mid Seral Forest Within Landscapes	•	•
Forests Alongside Streams, Lakes and Wetlands – Riparian and Fish Habitat	•	•
Red and Blue Listed Ecosystems	•	•
Stand Level Biodiversity – Forest Retention within Openings	•	•
Focal Species and Species at Risk	•	•
Climate Change (carbon levels; adaptation and risk)	•	•
Other Environmental Values and Implications	•	•

[41] The report is available at: http://srmwww.gov.bc.ca/ske/lrmp/morice

4.3 Stakeholder Preferences

SEEAs are intended to be value-neutral and science-based, and therefore do not document stakeholder preferences. In SEEAs, stakeholder input that is technically defensible is incorporated into the assessment of impacts on key values. However, in some situations there may be reasons to better document stakeholder preferences as part of the planning process:

- Planning processes that rely more on consultation than consensus may require specific documentation of stakeholder preferences to more fully inform decision makers of the implications involved in a decision.

- There may be governance issues associated with stakeholder preferences, in that the success of a land or resource management plan may depend on the support of the local community.

- Documenting stakeholder preferences can help ensure that socio-economic impacts and the general wellbeing of individuals are fully accounted for in the assessment.

While there may be strong reasons for decision makers to understand stakeholder preferences, documenting stakeholder preferences cannot substitute for rigorous socio-economic and environmental assessment. For example, stakeholder preferences may not always favour efficient use of Crown resources, and stakeholder groups do not always effectively represent all resources and interests.

Guiding Principle
Documenting stakeholder preferences involves seeking input from stakeholders, requesting and reviewing stakeholder statements or submissions, and preparing summaries of the information. While the documentation of stakeholder preferences and the SEEA could ultimately be combined in a single decision document, they are initially separate exercises and should be treated as such.

4.4 Demonstrating Trade-Offs

Guiding Principle
SEEAs are intended to demonstrate the advantages and disadvantages of the plan and/or each management scenario(s) and assist decision makers and stakeholders in weighing trade-off and balancing considerations. To facilitate trade-off analysis, the SEEA may also use weighting and ranking techniques to help demonstrate differences in expected outcomes between scenarios.

Trade-off analyses may involve an analyst eliciting value judgments from interested parties on what they believe are appropriate trade-offs or weights placed on different plan objectives (e.g. should access management planning designed to improve the co-existence of industrial activities, wildlife habitat, commercial tourism and recreation put more emphasis on one value than another?). This methodology is commonly referred to as Multi-Attribute Trade-off Analysis (MATA), and can be useful in documenting stakeholder preferences and in demonstrating how individuals applying different weights to the same set of criteria ratings can reach different conclusions.

5.0 Summary and Concluding Remarks

5.1 Summary

British Columbia's provincial Crown lands encompass approximately 900,000 square kilometres, a vast area which is subject to land use pressures from many different interests. Land use planning helps to ensure that decisions take into account communities, the economy and the environment. A socio-economic and environmental assessment assists planners, stakeholders, and decision makers in understanding the implications of different options.

The *SEEA Guidelines* provide a consistent format for assessing and documenting the range of implications involved. The general approach recommended here is that a base case is compared with alternative land use plan configurations. Six categories of implications are considered: Economic Development, Social Implications, Specific Aboriginal Implications, Provincial Government Finances, Net Economic Value, and Environmental Assessment. These categories are also pertinent to an assessment of sustainability.

To deal with the large number of complex and inter-related issues, the approach follows a "multiple accounts" format which allows for the inclusion of quantifiable outcomes and for qualitative analysis of outcomes which are not quantifiable (especially social valuations and environmental outcomes). Components of cost-benefit analysis are part of the overall framework.

Trade-offs are identified, to assist in finding solutions and resolving land use conflicts. A summary matrix can facilitate trade-off analysis by highlight advantages, disadvantages, associated uncertainties, and solutions.

In communicating the assessment results, clear writing, complete documentation, and transparency are important.

5.2 Concluding Remarks

These *SEEA Guidelines* can be used to guide analysis for large-scale Land and Resource Management Plans (LRMPs), as well as smaller-scale Sustainable Resource Management Plans (SRMPs) and other processes requiring socio-economic assessment, such as coastal plans, oil and gas pre-tenure plans, plans for the recovery of "specific-at-risk", and the Ministry of Forests' Timber Supply Review (TSR). The size and scope of the process and plans will determine the required depth and comprehensiveness of the analysis.

Although we recommend that analysts follow these guidelines when carrying out SEEAs, we are aware that different sets of circumstances may warrant different approaches than those presented here. In those cases, we suggest that appropriate

methods be agreed by SEEA analysts and the Strategic Land Policy and Legislation Branch of the Ministry of Agriculture and Lands.

The appendices to this document present more detailed information on methodologies concerning the base case, GIS data, forestry, tourism, recreation, minerals, petroleum resources, indirect and induced impacts, Net Economic Value, and environmental assessment.

In closing, we again note that the focus of these guidelines is on practical methods which can be used to obtain succinct and reliable SEEA information with the time, funding, and technical resources typically available. We acknowledge that the guidelines are not definitive, and our intention is that they will continue to evolve with new understandings and experience. We hope to further develop the sections of the guidelines pertaining to the environment and to social / community implications, and, as needed, we may add sections dealing with methodologies and sectors which have not been discussed in detail here.

Guidelines for Socio-Economic and Environmental Assessment

Appendices

APPENDIX 1
OVERVIEW: AREA ANALYSIS, RESOURCE ANALYSIS AND SEEA

As discussed in Section 2.5.1, during the planning process and after a land use plan is defined and mapped, two sets of analysis of the implications are undertaken by the provincial government technical team: an "Area Analysis" and a "Resource Analysis". Both of these compare the proposed plan to the base case. The results of these analyses then inform the socio-economic and environmental assessment. These steps are shown in Figure 1, and described below.

Area Analysis

The area analysis is a Geographic Information Systems breakdown of the entire plan area land base by management zone (e.g. numbers of hectares or percentages of the land base that are protected, or with management emphasis on environmental values, or with emphasis on development values, or with integrated management objectives).

The area analysis also provides a detailed breakdown of mapped resource values by management zone (e.g. % of timber harvest land base, energy reserves/potential, critical fish and wildlife habitat in various zones).

Resource Analysis

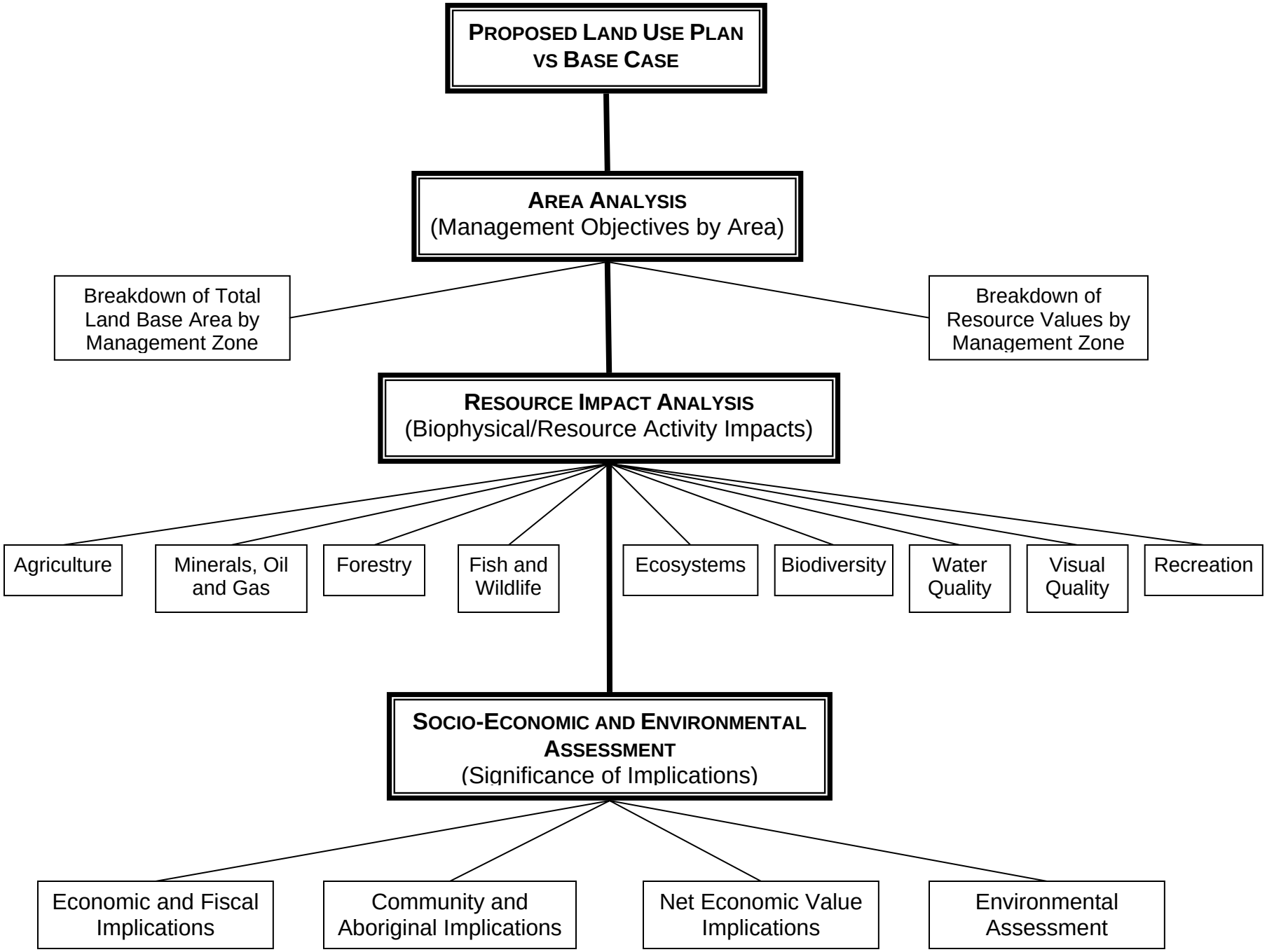
Based on the area analysis and resource management strategies, the resource analysis assesses short and long term implications for natural resource activity (e.g. timber harvest levels, energy production, fish/wildlife populations).

Socio-Economic and Environmental Analysis

The SEEA is an assessment of the significance or the value of resource impacts to residents of the plan area and of the province as a whole. Categories of evaluation include: Economic Development, Provincial Government Finances, Social Implications, Specific Aboriginal Implications, Net Economic Value, and Environment.

Time Requirements

As discussed in Section 2.4.2, for a comprehensive SEEA, assuming the land use scenarios have been defined and all the resource inventory maps are in the GIS system, and the necessary forest cover data is in the timber supply model, and the analysts are in place, it may take about 8 - 10 weeks for the GIS and timber supply analysis, and then another 8 - 12 weeks to do the SEEA. Additional time may be required for draft review by provincial agencies, communities, other stakeholders, and First Nations. If there are complications and/or a lack of resources, the process could take longer. Focused and condensed SEEAs could likely be completed more quickly.



APPENDIX 2
BASE CASE AND MANAGEMENT OPTIONS

Base Case Scenario

As discussed in Section 2.2, an SEEA of a specific land and/or resource management plan or initiative requires a comparison of what might occur under that plan relative to a base case scenario representing the default land and/or resource management regime.

The base case should include the regulations and resource management policies incorporated in:

- Timber Supply Reviews and AAC decisions by the Province's Chief Forester
- *Forest and Range Practices Act*
- *Environmental Assessment Act*
- Mineral Exploration Code
- *Mining Rights Amendment Act*
- *Water Act*
- *Wildlife Act*
- *Fisheries Act*
- *Fish Protection Act*
- *Heritage Conservation Act*
- Local Resource Use Plans (LRUPs)
- Wildlife Management Areas
- Coordinated Access Management Plans
- any other federal or provincial policy/legislation that affects the management of Crown land and resources.

It is recommended that technical staff be asked to produce a map which depicts benchmark management practices geographically in the plan area.

Expected future trends in the management regime, and related socio-economic and environmental trends, should also be assessed. Since future projections can be controversial, this should involve consultation with resource experts.

Since the base case is the marker against which the future implications will be assessed, it must be comprehensively analysed, but the focus should be on activities and resource values that are most strongly linked to Crown land and/or resource management.

In general, the provincial resource agencies will assess the bio-physical/resource impacts of the scenarios and provide relevant data to the SEEA analysts, who will determine the socio-economic and environmental significance of the biophysical impacts.

The definition of the SEA base case, discussed above, differs from the "base case" used by the Ministry of Environment in its environmental risk assessment (ERA) approach (see Section 3.6). In the ERA approach, the existing management regime and the management scenarios are both compared to a "low risk benchmark", which is based on best management practices or natural disturbance regime. The ERA approach allows consideration of situations in which the "status quo" or existing management regime itself involves risk to environmental values, due to past human activity and resource development.

For the ERA base case, background information that describes the historical as well as current trends for specified values will be useful for providing an indication of habitat capability, past cumulative impacts, and present suitability. Population status and/or habitat quality/quantity could be qualitatively described for fish and wildlife values as high, moderate, or low risk of increasing, decreasing or remaining stable into the future. Any known causes of past or anticipated future declines should be discussed.

Defining Multiple Land Use Options

Those involved in the planning process may design a preferred set of scenarios (management objectives and management zones). When specifying more than one scenario, they should be different enough from one another to facilitate meaningful comparisons. SEEA analysis comparing the scenarios with each other and with the base case would then help planners to produce a single land and/or resource management plan.

The range of values and interests reflected in the management scenarios are likely to be identified through public consultations and technical input from provincial resource agencies. Developing a unified management direction that has a broad base of support from communities and interest groups is often an important objective of the overall planning process, of which the SEEA is an important component.

Distinguishing Base Case and Alternative Scenarios

Difficulties may be encountered in distinguishing between forecast base case impacts and impacts resulting from the plan or alternative management scenarios. These issues should be resolved through discussions with provincial government technical staff.

- **"De Facto" Protected Areas** – There may be existing management areas restricting certain types of development, which are given official Protected Area (PA) status under a new plan. Care must be taken to assess and assign only those effects that are related to the incremental change in management – there may be no incremental timber harvesting impacts if an area already excluded from logging is proposed as a PA, especially if that area was already excluded from the THLB in recent Timber Supply Reviews.

- **Existing Strategic Plans** – Another situation is when the base case includes a broad strategic plan for the area (e.g. an existing LRMP or "Higher Level Plan"), which provides general management direction that is made more explicit under a proposed new landscape level plan. (Similarly, a resource management plan for a specific species may be combining various policies already existing under the federal *Fisheries Act*, the *Forest and Range Practices Act*, the *BC Wildlife Act*, or other legislation/regulation.)

  Determining whether an expected impact is the result of the existing strategic plan included in the base case, or is more appropriately considered to result from the new landscape level plan, can be difficult. In the case of an SEEA for a lower level plan (e.g. Species-at-Risk plans, oil and gas Pre-Tenure plans, Coastal plans and Sustainable Resource Management plans), it is likely that many of the management guidelines in the lower level plan implement the general strategic direction provided by an broad strategic plan.

  Where the strategic plan established only very broad principles (e.g. the need for a detailed access management plan), the SEEA of the lower level plan should estimate the full impacts of the new management guidelines in that plan, including those impacts which might reasonably be assumed to result from new implementation of existing strategic plan policy. Where possible, however, the SEEA should also indicate whether the impacts are due to the new initiatives of the lower level plan or relate more to a broader strategic plan.

  Where the lower level plan simply consolidates existing management direction (which has already been influencing management practices) from other plans, this would be considered part of the base case and the SEEA should exclude the impacts of those management practices.

APPENDIX 3
BACKGROUND GIS DATA

As discussed in Section 2.5.1, a first step in developing an SEEA is to collect background information on the land and resources, which are, or could be, important to the area.

Geographic Information System (GIS) data and analysis (often called “Area Statistics”) can quantify the extent to which various mapped resource values and activities (e.g. THLB, mineral and tourism potential) are overlain by different resource management zones (e.g. Protected Areas and No Timber Harvest areas).

Combined with an understanding of the management objectives/strategies in each zone, and the nature of the linkage between these strategies and activity in the resource sector, GIS analysis can provide an indication of implications of the land use plan compared to the base case.

This presentation can show, for example, the extent to which certain environmental values are represented in a Protected Area, or the amount of “high mineral potential” land that the Protected Area would make unavailable for exploration and development.

The overlaying of zones on resource values is particularly useful when the planning process is using a zoning type of approach. If zones are not used, more emphasis may be required on interpretation of the management objectives and strategies in the plan and their implications for the various resource values. At a landscape unit scale, different management objectives and strategies apply to individual or groups of landscape units, and GIS data can help in understanding the extent of potentially affected resource values in each landscape unit.

Table 6, below, shows how the Area Statistics could be presented.

Table 6. GIS Summary Area Statistics by Land Use Zone Category

For the base case and for each land and/or resource management scenario:

Key Mapped Resource Indicators for Plan Area (in hectares unless noted)	Total	Percent In Protected Areas	Percent In Lower Development Intensity Zones	Percent In General Management Zones	Percent In Resource Development Emphasis Zones
Plan Area Gross Land Base					
Forestry Timber Harvesting Land Base Mature Volume in THLB (m^3)					
Recreation & Tourism Primitive Recreation Areas High Value Recreation Features (#) High Tourism Capability Area Visually Sensitive Area					
Access Plan Motorised Access Non-Motorised Access					
Minerals/Petroleum Occurrences/Developed Prospects (#) High Mineral Potential Lands Mineral Tenured Area Proven Petroleum Reserves Potential Petroleum Reserves					
Agriculture High Capability Lands Range Tenured Area					
Environment Wildlife Habitat Suitability/Capability Maps for Key Species High Value Riparian Areas (km) Biogeoclimatic Units Site Series or Site Series Surrogates					
Other Values First Nations Traditional Use Areas Community Watersheds					

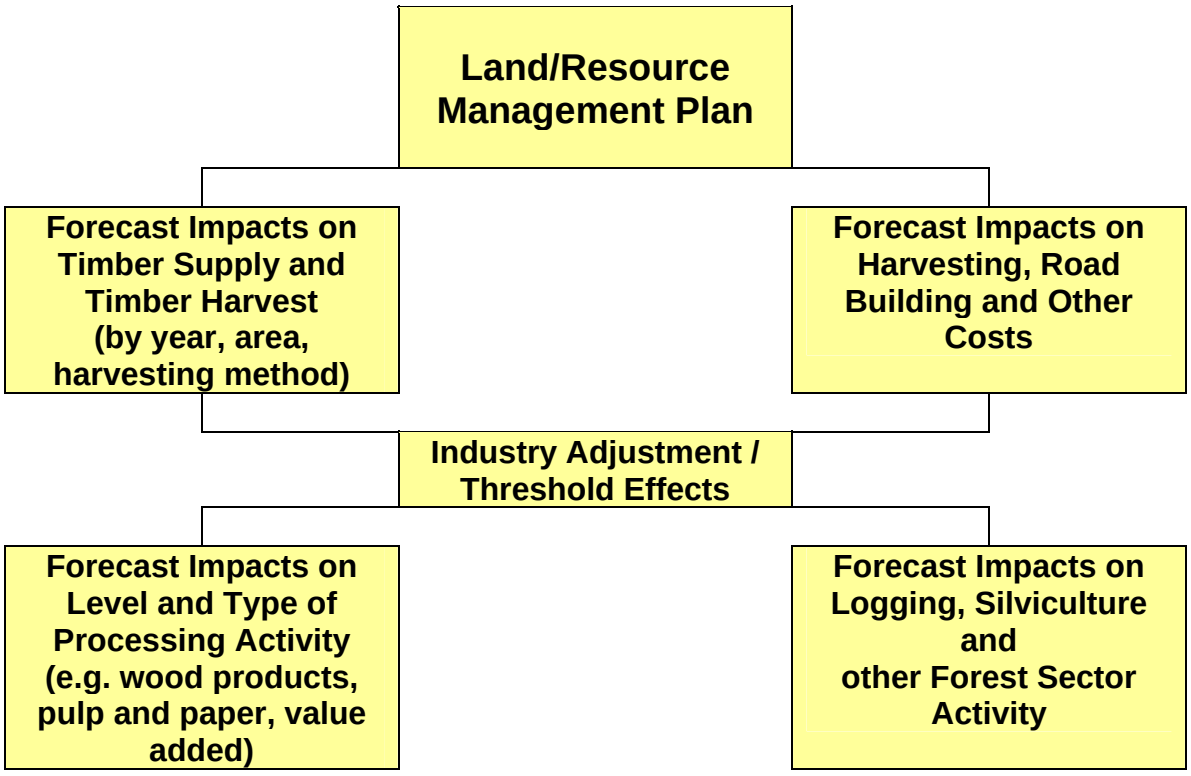
This table includes only a small sample of the resource indicators that may be appropriate for any particular plan. Indicators actually chosen should reflect the resource values being managed or affected by the plan, as well as their relative significance in the plan area.

APPENDIX 4
FOREST SECTOR METHODOLOGIES

In the SEEA, forest sector employment and revenue impacts are driven largely by the difference in timber harvest volumes and costs that are expected to occur with the land and/or resource management plan, compared those expected to occur under current management (the base case).

The first step is to assess current economic activity and to identify the strength of the linkage between the forest industry and the timber resources that may be affected by the land and/or resource management plan. The employment, income, and revenue effects can be estimated on the basis of the linkage and estimates of these values expressed per cubic metre of timber harvested. These factors are illustrated in Figure 2, and discussed in more detail below.

Figure 1 Forest Sector Linkages to Land and Resource Management Plans



Timber Supply Analysis

The management prescriptions in each scenario can directly influence timber supply available for harvesting over time. These impacts may be estimated with timber supply models and/or other landscape event simulation tools which explicitly address the impacts on the Timber Harvesting Land Base (THLB), the impacts on timber volumes, the length of time that the current timber supply can be maintained, and when any

decline in timber supply might occur in the future (i.e. "fall-down").[42] We suggest that comparisons of the base case with other scenarios be done using timber supply projections which follow Ministry of Forests harvest flow modelling policy, which requires the current allowable annual cut (AAC) to be maintained for as long as possible (to minimise impacts on **short-term harvest levels**) while limiting the harvest declines between decades to no more than 10% and maintaining a smooth transition to the long-term harvest level. The type of analysis methods and tools that may be used in assessing timber supply impacts are discussed in detail in the *Resource Analysis Guide*.[43]

Historical Harvest Volumes and Stumpage Rates
Data for historical harvest levels and associated provincial stumpage revenues can be obtained from the MOFR Harvest Billing System (HBS), which can be assessed at www.for.gov.bc.ca/hva/hbs. Information for particular forest districts can be obtained through the website. However, many land use plan areas require more detailed reporting, sometimes involving portions of several districts. Government technical staff may be able to assist analysts in querying the HBS and interpreting the resulting output.

When Timber Harvest Is Less Than Timber Supply

Timber supply analysis assesses the impact of a proposed land use and management plan on timber harvesting opportunities. However, in some cases actual harvest levels may be substantially below the AAC or the short-term level shown in a timber supply analysis. In such cases, because impacts on revenue and employment are linked to harvest levels rather than to the AAC, the SEA base case harvest forecast should be based on an average of actual harvest levels, and/or on expert opinion about likely future harvest levels.[44] Timber supply forecast comparisons would still be important for assessing the impacts of proposed plans on timber harvesting potential or opportunities. While it may be unlikely that the full timber supply would be harvested, increases or reductions in timber supply do represent a changes in the "upside potential" harvest level that might be possible if, for example, operational conditions were to permit and markets for forest products were sufficiently strong. In these sorts of cases, it would also be useful to note the reasons why the full timber supply has not been harvested.

Impacts Relative To Current Conditions

Decision-makers and local communities have often been interested in changes that may occur relative to current conditions. This often relates to concerns about how many current jobs may be at risk if timber harvest levels fall due to a land use plan. The SEEA could therefore report not only the differences between the two future forecasts (the base case and the land use plan) but also how conditions under the land use plan would differ from current conditions.

[42] For Environmental Risk Assessments, timber supply analysis that reports results spatially is usually the most useful.
[43] *Resource Analysis Guide*, Vol. 1, sect.4.8 http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background/rag.html
[44] In such cases, the SEA base case (i.e. the harvest forecast) will differ from the "base case" timber supply scenario used in the MOFR timber supply review.

Harvesting Costs and Operability Effects

The management prescriptions in each scenario or initiative can directly affect timber harvesting and silviculture costs. These additional costs may arise from reduced operating efficiencies (due to lower volumes being extracted from harvest areas), increased harvest planning effort, and alternate harvest methods, access routes, harvest scheduling or silviculture treatments. It is very difficult to assess the potential magnitude of these costs and how incremental they might be relative to what would have occurred under base case management. Discussions with forest licensees and with Ministry of Forests representatives could help in this regard.

Increases in harvesting costs can lead to "**operability effects**", which occur when timber that was previously marginally economic to harvest becomes uneconomic due to the increase in costs.[45] Higher costs may also reduce provincial government stumpage revenues, by reducing harvest volumes and by reducing the stumpage rates applicable to that volume (due to the recognition of higher costs in the MPS stumpage system).

Relocation Opportunities

Another issue to consider is whether currently unused or underutilised sites or timber resources are available. The most significant effect of a management scenario, even one which precludes such uses at certain sites, may be the costs incurred by operators to relocate the activity to alternative sites and potentially the higher operating costs/lower revenues at those sites if they are less suitable.

Dependence On Plan Area Timber

When assessing the impacts on the forest industry, it is important to consider the extent to which local processing facilities rely on "imported" fibre, or on "secondary" products, such as dimension lumber or chips, for which alternative supplies might exist. Other factors that could be taken into account include the proportion of the affected workforce living in the plan area, and the implications of adjustments such as periodic mill closures (i.e. resulting in income rather than job loss) and normal turnover in the workforce. An additional consideration is the possibility that cost and supply impacts can result in threshold effects on forestry processing and timber harvesting operations (e.g. closure of a mill or a logging camp).

[45] See *North and Central Coast LRMPs Operability Analysis of Government to Government Recommendations for Stand Level Retention* (BC MSRM, March 2005) http://srmwww.gov.bc.ca/rmd/srdb/analysis/index.htm

Forest Sector Employment

Direct employment – Direct forest sector employment includes woodlands and harvest related jobs, silviculture, processing at mills, and related administration.

- **Woodlands and Harvesting**
  Harvesting and other woodlands-related employment includes log salvage, log scaling, and harvest planning. Log hauling and road building and maintenance are counted as indirect activities, and are included in the multiplier-derived estimates discussed below. In recent years, there has been an increase in pre-harvest planning and the volume of timber harvested by innovative means such as helicopter logging, to address environmental concerns and regulations and the need to harvest in less accessible areas. Timber harvesting (by licensee employees and by contract loggers) is the component of the forest industry most strongly linked to harvest level changes. A change in harvest levels will be closely reflected by changes in harvesting employment levels.

- **Silviculture**
  In the Timber Supply Areas, licensees are responsible for basic silviculture, such as planting and surveying. In the Tree Farm Licences, licensees may also undertake enhanced or intensive silviculture, such as spacing, fertilising and pruning. Silviculture employment is less strongly linked to harvest level changes, because of the time lag between when harvesting takes place and replanting begins, and because enhanced silviculture activities are concentrated on areas previously harvested.

- **Timber Processing**
  Primary timber processing includes milling for lumber, veneer and plywood, log homes, poles and posts, shakes and shingles, and pulp and paper. Secondary or value-added processing includes products such as remanufactured wood products, engineered building products, millwork, cabinets, and furniture. Historically, technological change, consolidation of regional processing capacity, and the increase in value-added processing have been important factors affecting timber-processing employment coefficients. When timber harvest levels change, related employment changes in the processing sector depend on factors such as availability of alternative supplies, adjustments in capacity utilisation and minimum economic production levels. The linkage with harvest levels is weaker still in the case of value-added products, which use lumber as an input, and pulp and paper products which use sawmill waste.

Employment Coefficients – An employment coefficient is a measure of the number of **person-years** (PY) of employment associated with the harvesting of a thousand cubic metres of timber.[46] A person-year represents about 1,800 hours of work. Seasonal employment can be adjusted to PY employment to allow meaningful comparisons

[46] Reports presenting forest sector employment coefficients for coastal areas can be accessed at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis/projects_pubs

between sub-sectors of the forest industry. Harvesting and silviculture work is usually seasonal, so the number of jobs in these activities supported by the timber harvest is greater than the person-years. Timber processing is generally a year-round activity, and the number of processing jobs is roughly equivalent to the person-years.

Data for deriving employment coefficients can be collected from local operators, the provincial government, industry associations, and from the Ministry of Forests' Timber Supply Reviews (TSRs). In some cases, the employment and income coefficients prepared for the most recent TSRs will be sufficient for the purposes of an SEEA of a land and/or resource management initiative. However, where the TSR data are out-of-date, new surveys may be required to obtain current information.

It may be important to consider trends in employment coefficients. For example, the number of jobs per unit of output has declined since 1965 because of an increase in productivity resulting from technological change and industry consolidation. On the other hand, the number of jobs per unit of output in harvesting increased significantly between 1995 and 1999. If such trends are expected to continue, they could be taken into account when estimating income and employment effects in future years.

Indirect and Induced Employment – In addition to the direct forest sector employment associated with the timber harvest, there is also indirect and induced employment. "Indirect" employment is in businesses supplying goods and services to forest sector companies, for example in machine shops and in road building and maintenance operations. "Induced" employment is in businesses supported by the local re-spending of direct and indirect employment income, for example in local retail outlets. Indirect and induced employment may be estimated using multipliers from BC Stats.[47,48,49]

Indirect and induced effects are the least strongly linked to harvest changes of all the categories of impacts. This is because activity levels in affected sectors depend on spending by businesses and workers in industries other than forestry.

Forest sector indirect and induced impacts are discussed in more detail in Appendix 9 ("Local Area Indirect And Induced Effects") and Appendix 10 ("Provincial Economic Development Implications").

Qualifications to analysis – Impact estimates are indicators of the magnitude of change, rather than precise estimates. The following qualifications apply:

- Employment impacts calculated using coefficients are shown to occur immediately and in direct proportion to the change in the harvest level. While likely accurate for

[47] Conceptual issues with the use of multipliers are noted in Section 3.1.2.
[48] The BC Stats provincial multipliers are presented in the reports *British Columbia Provincial Economic Multipliers and How to Use Them* (BC Stats, 2005) at www.bcstats.gov.bc.ca/pubs/pr_pem.asp, and *Estimating Economic Impacts for the British Columbia Forest Sector* (Dr Garry Horne for BC Stats, October 2005), at www.bcstats.gov.bc.ca/pubs/econ_dep.asp
[49] For local areas, multipliers and employment / income dependency information can be found in the BC Stats "Local Area Economic Dependency tables" at www.bcstats.gov.bc.ca/pubs/econ_dep.asp

the harvesting sub-sector, this may not be the case for the milling sub-sectors, which have weaker links to harvest levels and where impacts are more likely to occur at threshold levels at which shifts may be dropped or mills closed. Indirect and induced impacts would likely occur over a longer period of time, as business and consumer spending levels adjust.

- The direct employment coefficients are derived from surveys of industry operating in the area, and reflect prevailing productivity, harvest practices and forest management. The coefficients may not reflect industry operating conditions in the future. In the short to medium term, trends in harvesting and processing may not result in major changes in the employment coefficients, in part because such trends can be mutually offsetting. For example, increased requirements for pre-harvest planning and more ecologically sensitive harvesting methods can partly offset the trend to mechanisation and second-growth harvesting methods. Also, the trend to labour saving timber processing technology could be partially offset by growth in the value-added sector. In their SEEA work, analysts should note the considerable uncertainty attached to projections made beyond the first decade.

Employment Income – Analysts may differentiate between different measures of income, such as gross payroll (which includes wages and benefits), before-tax income net of benefits, and after-tax income available for spending in local communities. Gross payroll is most relevant when assessing provincial impacts, whereas after tax income is most relevant when assessing local impacts. Gross payroll includes all wages and benefits paid by employers. Before-tax income net of benefits is most representative of what people normally consider to be related to their wage or salary.

Summary

- Employment and revenue impacts are driven by the difference in timber harvest levels and harvest costs that are expected to occur with the land and/or resource management plan, compared with those expected to occur under current management (the base case).
- Direct employment impacts are calculated by multiplying “employment coefficients” (jobs per cubic metre harvested) by forecast timber harvest volumes. Indirect employment impacts may be calculated by applying “multipliers” to the direct employment figures.
- Provincial government stumpage revenue implications are calculated by applying forecast stumpage rates to the forecast harvest levels.
- For periods more than a decade in the future, forecasts based on current economic and technical conditions are subject to increasing uncertainty.

APPENDIX 5
TOURISM SECTOR METHODOLOGIES

Tourism may be defined as activity related to the spending of visitors to the Plan Area on such activities as accommodation and food, recreation activities and transportation (defined in this way, tourism includes business travellers and would be consistent with international definitions of tourism). Outdoor recreation involves non-commercial activities, and is discussed separately in Appendix 6.

"Front-country" tourism facilities depend primarily on highway traffic, such as hotels and restaurants in communities. "Back country" tourism opportunities depend on relatively pristine environments, with an abundance of natural features and views, and are therefore more likely to be affected by land use planning.[50] Some sources for backcountry tourism data are listed in Appendix 4.

The tourism activities related to the backcountry can be grouped into three categories:

- **Guided outfitting / hunting:** In British Columbia, out-of-province hunters are required by regulation to use a BC licensed hunting guide. While guided hunting is the primary product offered by hunting guide operations, many also offer wilderness adventure and wildlife viewing tours outside prime hunting seasons.

- **Guided sport fishing**: British Columbia offers world-class ocean salmon fishing and freshwater angling opportunities. Fishing lodges and guided angling are important sub-sectors of the backcountry and mid-country tourism sector.

- **Adventure tourism and eco-tourism:** British Columbia is becoming increasingly popular as a destination for adventure tourism and eco-tourism. Activities include marine activities (e.g. canoeing, kayaking, marine cruising, sailing, and river rafting) and land based activities (e.g. hiking, nature-viewing, trekking, horse trail riding, heli-skiing, Nordic skiing, snowmobiling, ATVs, and backcountry skiing).

Assessing Impacts

Cause-effect linkage – A first step in evaluating the impacts of a land and/or resource management plan on tourism is to assess the nature and strength of the cause-effect linkage between the tourism sector in an area and management strategies and objectives of the plan. For example, a management initiative may directly affect tourism businesses that depend on "backcountry" tourism opportunities, but may not affect "front-country" tourism facilities. The extent to which tourist activity is affected will depend on the importance of the affected resources to the amount and type of tourism in the area.

[50] Particularly related to protected areas, scenic viewscapes, and access (motorised and non-motorised).

We note that tourism operations may be able to adjust to land and/or resource management changes, for example by changing the timing and areas of operation, or even the nature of the activities offered. Also, tourism operations (and recreation enthusiasts) may be able to relocate activities to sites that are currently unused or underutilised. In such cases, the most significant effect of a management scenario, even one which precludes such tourism or recreational uses at certain sites, may be the costs incurred by operators and users to relocate the activity to alternative sites and potentially the higher operating costs/ lower revenues at those sites if they are inferior.

Extent of activity and impacts – When assessing the impacts of a land and/or resource management plan, it is important to determine the extent of each activity and the impacts of management direction on those activities. For guide-outfitting, for example, this may involve obtaining data on hunting days for non-resident hunters for the Wildlife Management Units that overlap the area and estimating the associated socio-economic impacts from industry averages or an industry survey of individual guide-outfitters in the region under study.

The socio-economic impacts from guide-outfitting, guided angling and adventure tourism could then be assessed in terms of days of activity, number of operators, direct employment (Person Years/ Full Time Equivalents), income levels, provincial government revenues and Net Economic Value. We suggest that the impacts on provincial government revenues include only direct corporate taxes and payments (and not income taxes from employment). This is discussed in more detail in the context of methodologies that pertain to the assessment of government revenues.

Land base statistics – Land base statistics can provide a useful way to present the impacts of a land use plan on the tourism sector.

Table 7. Examples of Tourism Values

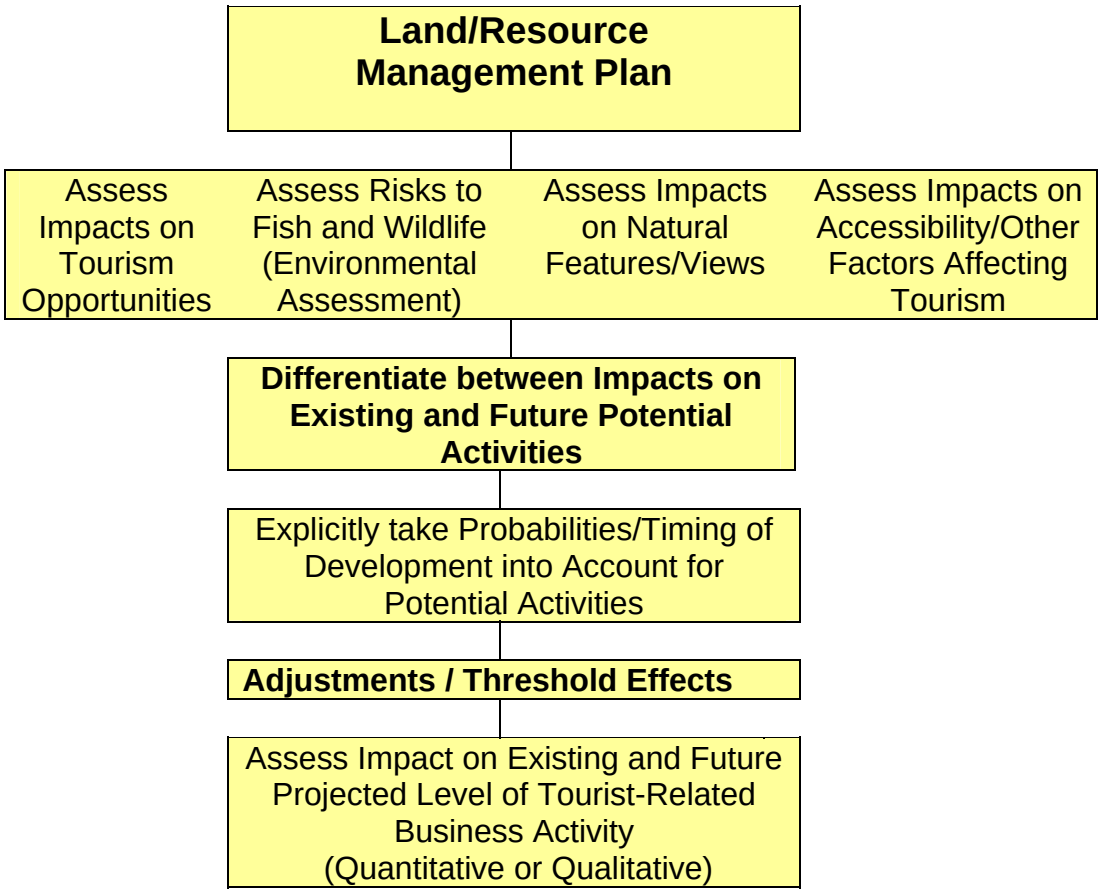
Plan Area Tourism and Recreation Values	Total Plan Area *(ha)*	Base Case		Land Use Plan	
		Protected	General	Protected	General
Total Land Base	xxx ha	xx%	xx%	xx%	xx%
Scenic Areas (Timber Supply Review):					
R- Retention	xxx ha	xx%	xx%	xx%	xx%
PR - Partial Retention	xxx ha	xx%	xx%	xx%	xx%
M – Modification	xxx ha	xx%	xx%	xx%	xx%
Total Scenic Areas	xxx ha	xx%	xx%	xx%	xx%
Existing Tourism Facilities:					
Fishing Lodges	##	xx%	xx%	xx%	xx%
Other Lodges	##	xx%	xx%	xx%	xx%
Other Facilities	##	xx%	xx%	xx%	xx%
Existing Tourism Features:	##	xx%	xx%	xx%	xx%
Anchorages	##	xx%	xx%	xx%	xx%
Recreation Trails (km)	##	xx%	xx%	xx%	xx%

The information presented above can help to assess the impact of a land use plan from the following perspectives:

- The extent to which scenic areas gain increased protection through the plan.
- The extent to which tourism and recreation facilities and features are insulated from extractive resource development incursion.
- The extent to which fish and wildlife habitat are protected from resource development activities.
- The extent to which specific tourism and recreation management initiatives encourage or discourage tourism and recreation activities.
- The extent to which the land use plan provides greater land use and operational certainty for tourism service providers, as well as positive international perception (e.g. of a locally endorsed, environmentally supportive, and socially responsible tourism industry).

Figure 3 illustrates the steps described above.

Figure 2 Tourism Sector Linkages to Land and Resource Management Plans



APPENDIX 6
RECREATION SECTOR METHODOLGIES

Outdoor recreation is usually defined as non-commercial outdoor activities enjoyed by residents and non-residents of the Plan area, and does not involve the use of a commercial guide. Outdoor recreation involves many of the same land base attributes used by the tourism sector.

As with the tourism sector, we suggest that analysts undertake the following steps:

1. **Assess the cause-effect linkage** – A first step in evaluating the impacts of a land and/or resource management plan on the recreation sectors is to assess the cause-effect linkage between the recreation sector in an area and the management strategies and objectives of the plan or management initiative.

   For example, recreation in a specific area may be primarily focused on front-country activities such as swimming, water skiing and boating, and therefore not likely to be affected by a management plan that restricts access to the backcountry.

2. **Level of recreational activity affected** – The second step is to determine the level of recreational activity that may be affected by a land or resource management plan.

   The level of recreation days associated with a specific area can best be estimated by activity type through discussions with stakeholders and a review of provincial government data. Comparison with other regions of British Columbia for which there is information may also provide some insight. Activities that may be affected include hunting, angling, snowmobiling, backcountry skiing and other winter activities, motorised summer activities (e.g. ATVs), bicycling, hiking, trail riding, and boating (including kayaking, canoeing, and power cruising).[51]

3. **Assess the net benefit** – The third step is to assess the net economic value from recreation activities, which may include estimates of recreationists' willingness-to-pay for activities and the extent to which this exceeds their actual level of expenditures.

   Time and budget constraints may preclude undertaking original survey research on the value of recreation activities for a specific region, and the analysis may therefore rely primarily on publicly available estimates of willingness-to-pay by activity.

These steps are represented in Figure 3, below.

[51] Recreational activities will be particularly affected by access management provisions of a land use plan. Restrictions on motorised access would reduce opportunities for some users (e.g. snowmobilers, motorcyclists, ATV operators), but could enhance the backcountry experience for other users (e.g. hikers). Access management provisions of a plan are usually intended to allow the area to offer a variety of high quality recreation experiences.

Figure 3 Recreational Activity Linkages to Land and Resource Management Plans

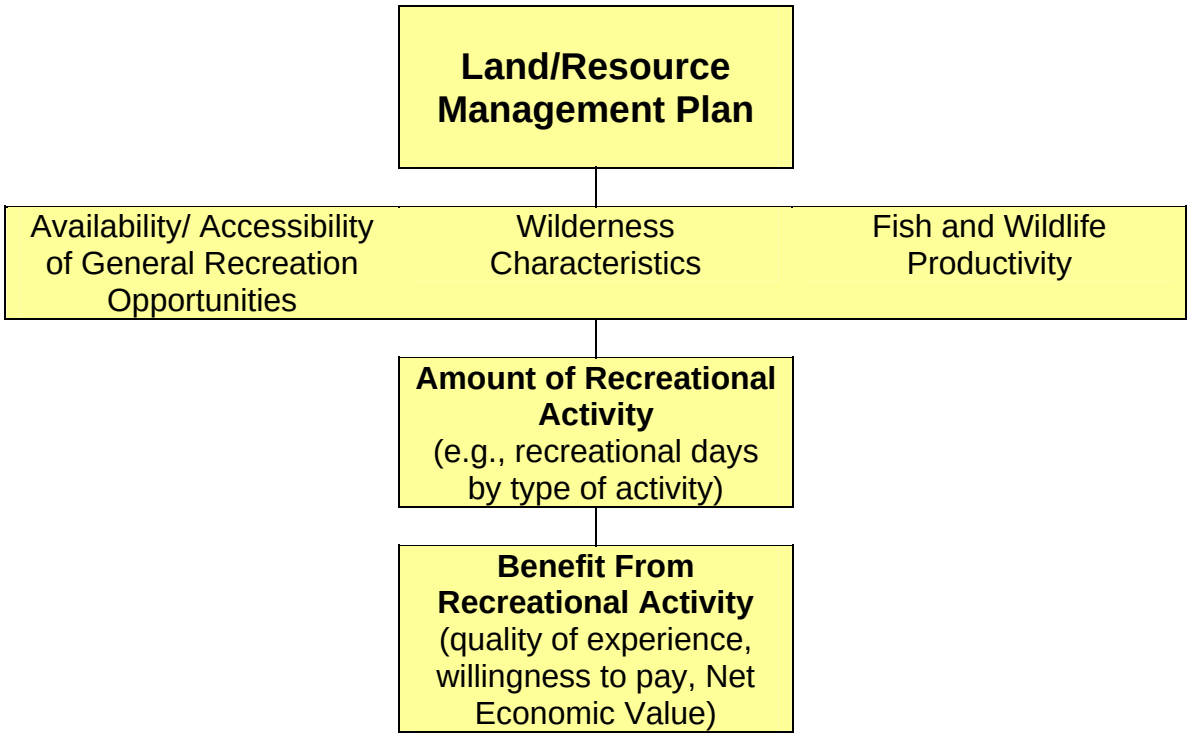


Table 8, below, provides examples of recreation activities and shows how data on level of activity, direct expenditures and net economic value could be presented.

Table 8. Economic Significance of Recreation in a Plan Area

Activity Type	Annual Level of Activity In Plan Area	Expenditures Per Day	Net Economic Value Per Day
Resident Hunting	# of hunter days		
Resident Angling	# of angling days		
Wildlife Viewing	# recreation/visitor days		
Camping	# of camping visits		
Other Activities e.g. snowmobiling, ATVs, horseback riding, cross-country skiing, hiking and bicycling	# of recreation days		
Total	Total # of recreation days		

Note: Data for expenditures per day and estimates of Net Economic Value can be obtained from Environment Canada and from BC Ministry of Environment (see Appendix 14).

This information could be provided for “base case” conditions, and the analyst could comment on changes that might occur due to a land use plan.

The table of GIS area statistics for tourism, presented in Appendix 5, is pertinent to the

recreation sector. In addition to that presentation, the following statistics could be considered:

Table 9. Sample Area Statistics for Recreation

Plan Area Tourism and Recreation Values	Total Plan Area *(ha)*	Base Case		Land Use Plan	
		Protected	General	Protected	General
Total Land Base	xxx ha	Xx%	xx%	xx%	xx%
Access Restrictions:					
Non-Motorised All Seasons					
Non-Motorised Summer Only	xxx ha	Xx%	xx%	xx%	xx%
Summer Restricted Motorised	xxx ha	Xx%	xx%	xx%	xx%
Non-Motorised Winter Only	xxx ha	Xx%	xx%	xx%	xx%
Recreation Opportunity Spectrum					
Roaded Modified	xxx ha	Xx%	xx%	xx%	xx%
Roaded Natural	xxx ha	Xx%	xx%	xx%	xx%
Primitive	xxx ha	Xx%	xx%	xx%	xx%
Rural	xxx ha	Xx%	xx%	xx%	xx%
Semi-Primitive Motorised	xxx ha	Xx%	xx%	xx%	xx%
Semi-Primitive Non-Motorised	xxx ha	Xx%	xx%	xx%	xx%
Urban	xxx ha	Xx%	xx%	xx%	xx%

Appendix 14 notes data sources that may assist with analysis of recreation sector implications.

APPENDIX 7
MINERALS SECTOR METHODOLOGIES

Subsurface resources are hidden and for the most part, lack observable and measurable features. As a result of their hidden and unquantifiable nature, subsurface resources present unique challenges for land use planning and resource management. Projections regarding future development are highly uncertain.

A land use plan may affect existing operations and future prospects in several ways:

- by establishing protected areas;
- by providing information on areas which have special values and may have rules or guidelines on development activities, e.g. Wildlife Habitat Areas;
- by establishing consultation protocols with First Nations and local communities; and,
- by endorsing the provincial two-zone system for mineral exploration and development[52] by establishing access to the landbase outside protected areas

Often, the result of a land use plan is a smaller area in which to explore for and develop resources, but increased certainty on which activities are appropriate for a given area.

When estimating the impacts of a land and/or resource management plan on the minerals sector, it is helpful to consider the following factors:

- Current employment and income dependency on the mineral exploration and mining sectors (data from BC Stats).
- Existing operating mines/producers (metallic, industrial, coal and aggregate) and the associated employment, gross revenues, capital expenditures, and mine life.
- Known reserves/resources in the region.
- Exploration expenditures - the Assessment Report Indexing System (ARIS) of the Ministry of Energy, Mines and Petroleum Resources (MEMPR) provides data on exploration expenditures by region. The data can be averaged over a selected period and compared with the British Columbia average. For example, a 20 year period would show longer term trends, while a 5 year average would show short-term trends.
- Active exploration projects.
- Known mineral occurrences, including showings, prospects, developed prospects, and past producers.
- Mineral, placer and coal tenures (including Crown grants).
- Known coal fields.
- Metallic and industrial mineral potential and the significance of the region to British Columbia in terms of mineral potential.
- Aggregate (sand, gravel, and crushed stone) potential, if available, and known active and inactive aggregate pits.

[52] In 2002, the British Columbia government legislated a two-zone system for mineral exploration and mining, to provide certainty regarding access to land. Mineral exploration and development are permitted, subject to applicable legislation, throughout the province, except for parks, ecological reserves, and “protected areas” where mining is prohibited under the *Environment and Land Use Act*.

We suggest that analysts attempt to explicitly address, either quantitatively or qualitatively, the extent to which the probability and timing of possible developments are affected by the land use management scenarios compared with the base case.

Mineral Potential Analysis and its Limitations

- We suggest that analysts review the MEMPR document *The British Columbia Mineral Potential Project 1992-1997*, in order to understand the mineral potential data and its limitations (see page 37: "Limitations of Mineral Resource Assessments") www.em.gov.bc.ca/DL/GSBPubs/GeoFile/GF2004-2/GF2004-2.pdf
- The Mineral Potential project was initiated in 1992 by the Geological Survey Branch of the Ministry of Energy and Mines, to support land use planning by ranking the provincial land base according its assessed ability to support mineral exploration and extraction.
- Since then analysis techniques and technologies have improved, exploration activity has increased, and some areas of the province have been covered by more up-to-date geophysical, geochemical or geological surveys. Additionally, knowledge of deposit models are constantly undergoing refinements that provide a better understanding of their geological settings and controls of mineral deposits.

  The mineral potential data has not been updated to accommodate such advances.
- The mineral potential analysis was conducted at a 1:250,000 scale, and therefore using this data at smaller scales may be inappropriate.
- Areas ranked as having "low" potential do not necessarily mean that the area actually has low mineral potential, instead the ranking may be based on a lack of information.
- While it is important to appreciate these limitations, the mineral potential data set remains an important tool for socio-economic and environmental assessment of land use plans and resource management initiatives.

A land use plan may affect future potential activities, rather than existing activities. However, there is no widely accepted methodology for estimating the socio-economic implications associated with changes in access to areas or regions with mineral potential under a land use plan relative to the base case.

The likelihood and timing of exploration and development are already subject to considerable uncertainty, due to factors such as world market prices, technology changes, new information and new discoveries. Given the hidden nature of the resources and other unknowns regarding future mineral values and mining technologies, methodologies that are broadly applied to the landbase are highly speculative. Very few mineral occurrences are ever developed into mines, and conversely, there are cases of mines being developed in areas that were previously considered to have low mineral potential.

One approach would be to apply probabilities of discovery and development to arrive at discounted Net Present Value per hectare.[53] However, there is uncertainty about the

[53] An example of this approach is the work of BriMar Consultants and Finisterre Holdings (2003) which estimated the value of various mineral tracts for the Coast Information Team (CIT). The report, "*Economic Gains Spatial Analysis (EGSA) Minerals Sector Study*", can be found at: www.citbc.org/w-EGSA-MOGs-fin-05Apr04.pdf

appropriate probability values to use and about the validity of using mineral potential information to create development and production scenarios.[54]

These issues are highly pertinent because when minerals are explored for and developed they often produce high levels of employment, incomes, and government revenues. Such values could far outweigh the values associated much more certainly with other economic sectors, and lead to an inappropriately skewed presentation of combined impacts. On the other hand, to say nothing about mineral values would also be inaccurate.

Our suggestion is to provide two sets of information: Geographic Information System based statistics, and, if useful, an "illustrative example" of an appropriately representative mine development.

Mineral Potential and GIS Data Table

Mineral potential data and GIS data can be used to construct a table which shows useful indicators for the base case, the land use plan, and any other management scenarios being considered. Some examples include:

- Percentage of landbase accessible to mining.
- Percentage of Very High Mineral Potential area accessible to mining.
- Percentage of Very High Industrial Mineral Potential area accessible to mining.
- Number and status of mineral occurrences in new Protected Areas .
- Crown grants and mineral, placer and coal tenures (hectares) in new Protected Areas .

An example of this type of presentation is shown below. (Not all of the categories would apply in every case. Analysts could use the indicator categories applicable to the specific situation being examined.) This type of table could be used to show the following:

- The proportion of the plan area land base managed as protected areas before the land use plan, and the percentages of those areas that involve very high metallic mineral potential areas, mineral occurrences (producers, past producers, developed prospects, prospects and showings), aggregate resources and coal fields.

- The impacts of increasing the proportion of the plan area that is protected, with incremental impacts on areas of mineral potential, mineral occurrences (producers, past producers, developed prospects, prospects and showings) aggregate resources, coalfields and mineral tenures (including Crown grants).

[54] For discussion of these issues, see http://www.citbc.org/EGSA-MOGs-Hodge.pdf, http://www.citbc.org/EGSA-MOGS-Power.pdf, and http://www.citbc.org/EGSA-MOGs-AuthResp.pdf

Plan Area Mineral Values	Total Area (ha)	Base Case		Land Use Plan	
		Protected	General Management	Protected	General Management
Total Land Base	xxx ha.	x.x%	x.x%	x.x%	x.x%
Metallic Mineral Potential (ha)					
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Moderate	xxx ha.	x.x%	x.x%	x.x%	x.x%
Low	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very Low	xxx ha.	x.x%	x.x%	x.x%	x.x%
Industrial Mineral Potential (ha)					
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Moderate	xxx ha.	x.x%	x.x%	x.x%	x.x%
Low	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very Low	xxx ha.	x.x%	x.x%	x.x%	x.x%
Aggregate Potential (ha)					
Primary	xxx ha.	x.x%	x.x%	x.x%	x.x%
Secondary	xxx ha.	x.x%	x.x%	x.x%	x.x%
Crown grants (ha)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Mineral and Placer Tenures(ha)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Coal Fields Area (ha)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Coal Tenures (ha)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Metallic Mineral Occurrences					
Producer	#	x.x%	x.x%	x.x%	x.x%
Past Producer	#	x.x%	x.x%	x.x%	x.x%
Developed Prospect	#	x.x%	x.x%	x.x%	x.x%
Prospect	#	x.x%	x.x%	x.x%	x.x%
Showing	#	x.x%	x.x%	x.x%	x.x%
Total	#	x.x%	x.x%	x.x%	x.x%
Mineral Exploration Expenditures (ARIS)					
Number of sites	#	x.x%	x.x%	x.x%	x.x%
Amount of expenditures ($ mil.)	$$	x.x%	x.x%	x.x%	x.x%

"Illustrative Example" Approach

As discussed above, it may not be valid to indicate whether particular types of mineral developments may or may not occur as a result of the plan. However, it may be useful to indicate the types of values that would be associated with the development of the area of highest mineral potential, if such development were to occur. This could be done with an "illustrative example" constructed as follows:

- Using the predicted probabilities in the mineral potential data, determine the most likely deposit type to be found in the region (at 90th percentile).
- Then, using available and technically defensible information, such as the Building

Blocks, describe the economics of a particular type of mine if one was developed – employment, capital investment, operating costs, annual revenues, annual cash flow and profit, and taxes and royalties paid to the provincial government.[55]

An important consideration with respect to employment levels is the proportion of jobs that might be held by local residents should a mine be developed in the area. It is increasingly common for mines to work closely with local communities and First Nations in an attempt to maximize the proportion of local mining jobs held by local residents. Also, employment related to exploration expenditures, and how that might change as a result of the land use plan, could also be included in any analysis.

For protected areas, based on how much of a mineral tract is recommended for protection, it could be noted that the probability of discovery of the deposit may decrease – in fact the deposit may end up in the protected area. Regarding the operating land base, it could be noted that the probability of discoveries may increase due to greater land use certainty.

The following table, from the Building Blocks, shows information that might be presented in three types of "illustrative examples" for a metal mine.[56]

Development Phase	**CASE A Underground Mine (Small)**	**CASE B Underground Mine (Large)**	**CASE C Open Pit Mine (Large)**
Commodity	Gold Silver	Lead-Zinc-Silver	Copper- Gold
Processing Capacity (tonnes/day	500	3,000	60,000
Operating Employment	110	335	405
Exploration and Development ($ mil.)	9.0	27.0	18.0
Design and Construction ($ mil.)	42.0	296.0	440.0
Operating Costs ($/tonne)	76.0	$57.00/tonne milled	$4.41/ tonne milled
Offsite Handling And Shipping Costs		$75.00/ tonne shipped	$75.00/ tonne shipped
***Ongoing Capital Costs** ($' M, life))*	2 (5 years)	16 (15 years)	69 (20 years)
Closure Costs ($ mil.)	4.0	15.0	20.0
Rehabilitation Costs ($ mil.)	2.0	5.0	5 + 1/year In perpetuity

Using technically defensible data and assumptions, the SEEA analyst could also estimate the employment and the provincial government tax revenues associated with the example.

Selected information generated following the approaches suggested here could be presented in the summary matrix, along with information related to other SEEA sections.

[55] In some cases, there may be existing operating mines that could be used as the basis for an illustrative example. In other cases, a theoretical example could be constructed from assumptions.
[56] The building blocks for minerals are at:
www.al.gov.bc.ca/clad/strategic_land/econ_analysis/data_sources

APPENDIX 8
PETROLEUM SECTOR METHODOLOGIES

Land use planning usually involves identifying resource values through inventories, providing management direction through a series of objectives and strategies, and possibly creating protected areas or management zones. The hidden nature of subsurface resources presents management challenges and means that estimates of oil and gas reserves and projections of future development are highly uncertain.

Petroleum resources in British Columbia include oil, natural gas, and coalbed methane. A land use plan may affect both discovered and undiscovered resources and future prospects in the following ways:

- by establishing protected areas or zones where minimal surface disturbance is allowed (although in some cases directional drilling can be used to access petroleum resources while meeting the goals of these areas);
- by establishing areas which have strict rules or guidelines on development activities (e.g. the Muskwa-Kechika Management Area);
- by providing information and setting management objectives for areas where the conservation of one or more resource values, such as wildlife habitat, recreation, or community **watersheds**, are recognised as priorities for resource management;
- by establishing consultation protocols with First Nations and local communities; and,
- by providing access to the landbase outside protected areas.

Often, the result of a land use plan may be a smaller area in which to explore for and develop resources, but greater certainty of access to resources in the remaining area.

When estimating the impacts of a land and/or resource management plan on the petroleum sector, it is helpful to examine the following factors;

- employment and income dependencies on the oil and gas sector (BC Stats);
- numbers of wells drilled (exploration and development);
- existing production facilities and the associated employment, gross revenues, and development / capital expenditures;
- proved reserves / resources in the region[57] and production trends; and,
- exploration expenditures – the Ministry of Energy, Mines and Petroleum Resources provides data on petroleum exploration expenditures and land sales, from which short-term and long-term trends can be identified; and
- provincial government revenues from royalties and land sales.

We suggest that the SEEA impact analysis compare the oil and natural gas production and potential likely to occur in the base case with those likely to occur under the land

[57] "Proved reserves" are quantities of petroleum which can be estimated with reasonable certainty to be commercially recoverable from known reservoirs under current economic, operating, and regulatory conditions. Proved reserves can be categorised as developed or undeveloped. Unproved reserves may be classified as "probable reserves" and "possible reserves". Probable reserves are unproved reserves which are considered likely to be recoverable. Possible reserves are unproved reserves which are considered less likely to be recoverable than probable reserves.

use plan (acknowledging the uncertainty associated with sub-surface resources). Two sets of information should be provided: Geographic Information System (GIS) statistical analysis (see the next section for more information), and economic values based on production forecasts.

Petroleum Potential and GIS Data Table

GIS analysis of petroleum data can be used to construct a table which shows useful indicators for the base case, the land use plan, and any other management scenarios being considered. Some examples of the analysis results may include:

- percentage of the landbase accessible to exploration and development;
- amount of reserves and percentage of the area with proved reserves accessible;
- amount of resources and percentage of area accessible with "high" and "very high" oil and gas potential; and
- numbers of wells and kilometres of pipelines that are located in proposed protected areas and the operating land base.

An example of this type of presentation is shown below:

Plan Area Mineral Values	Total Area (ha)	Base Case		Land Use Plan	
		Protected	General Management	Protected	General Management
Total Land Base	xxx ha.	x.x%	x.x%	x.x%	x.x%
Proved Oil (ha and cubic metres)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Proved Natural Gas (ha and cubic feet)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Oil Potential (ha and cubic metres)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Nat. Gas Potential (ha and cubic feet)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Very High	xxx ha.	x.x%	x.x%	x.x%	x.x%
High	xxx ha.	x.x%	x.x%	x.x%	x.x%
Oil and Gas Tenures (ha)	xxx ha.	x.x%	x.x%	x.x%	x.x%
Number of Wells (#)	Xxx #	x.x%	x.x%	x.x%	x.x%
Pipelines (km)	Xxx #				

Petroleum and Natural Gas Production Forecasts

We suggest that the SEEA analyst compare potential oil and natural gas reserves accessible in the planning area under the base case with those estimated to be accessible under the land use plan, and to use this information to estimate future oil and natural gas production levels.[58,59]

For example, the establishment of new protected areas would reduce the land area available for exploration (unless directional drilling was permitted), likely meaning fewer available reserves and lower production over time. Similarly, if lands outside protected areas were subject to stricter controls under a land use plan (for example, zones in the Muskwa-Kechika Management Area), the increased costs may mean that fewer reserves would be developed in future.

The production estimates can then be used to estimate implications of the land use plan for employment (area residents and non-residents) and provincial government revenues (annual production royalties and land bonus bid revenues).

The key implications can be summarised in the following type of table.

	Base Case Scenario	Land Use Plan	Difference
Total Estimated Potential Oil Production Volume *(million m³)*			
Total Estimated Potential Natural Gas Production Volume *(BCF or TCF)*			
20 Year Average Exploration/Production Jobs *(Person Years)* - Area Residents - Other BC Residents			
Average Annual BC Government Revenue *($millions)*			

The information presented here can contribute to the discussion in other sections of the SEEA: economic development, communities, First Nations, provincial government finances, and environmental implications.

Building blocks related to oil and natural gas can be accessed at:
www.al.gov.bc.ca/clad/strategic_land/econ_analysis/data_sources

[58] An example of the valuation of gas potential is provided in *Socio-Economic Assessment of the Besa-Prophet Pre-Tenure Plan – Phase I*, BriMar Consultants Ltd. (2002), available at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis/projects_pubs
Another example is in the socioeconomic assessment presented in the Fort Nelson LRMP (1997), which can be accessed at http://srmwww.gov.bc.ca/rmd/lrmp/frtnelsn/fort_nelson_lrmp.pdf

[59] We note that developing a model to project future production based on proved/potential reserves and anticipated markets would involve significant work and consultation, and that this extent of analysis may not be appropriate in all circumstances (e.g. for small planning areas).

APPENDIX 9
LOCAL AREA INDIRECT AND INDUCED EFFECTS

Indirect employment and income (from spending on supplies and services) and induced employment and income (from spending by direct and indirect employees) play an important economic development role in plan areas and in the province as a whole. For example, the spending of forest sector companies and their workers supports much economic activity locally and elsewhere in the province. For SEEA purposes, it is important to have a practical, reasonably accurate, and technically valid way to estimate the extent of the indirect and induced activity. This appendix reviews the issues involved, and discusses the use of local area economic multipliers. (Provincial multipliers are discussed in Appendix 10, following).

Limitations of Multipliers

As noted in Section 3.1.2, using economic multipliers is a cost effective way to estimate the indirect and induced effects of various economic sectors on a region and the impacts of changes on these sectors. However, there are shortcomings:

- multipliers do not recognise threshold effects or the ability of communities to adjust to change;
- they are derived from assumptions regarding which sectors are considered "basic" to a region; and
- they fail to recognise distributional impacts between regions.

It is important that SEEA analysts who use multipliers recognise the limitations, view the results as very approximate, and communicate these issues in reporting their work.

Local or Plan Area Multipliers

Multiplier estimates developed by BC Stats and based on an "economic base" methodology are commonly used in assessments of land and/or resource management plans in British Columbia. At the local area level, economic base multipliers are derived from assumptions which define certain sectors as "basic" to a region (e.g. forestry, tourism, and mining), and which drive the local economy by bringing income into the local area from outside. The "basic" sectors are distinguished from "non-basic" sectors (e.g. parts of service and retail sectors) that are dependent on local spending of businesses and workers in basic industries.[60]

The BC Stats Local Area model is based largely on Census Labour Force data, and produces multipliers for local areas and broader regions (LRMP areas, Forest Districts, Health Service Delivery Areas, and Health Authorities).[61,62]

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[60] "Non-basic" is the same as "induced".

[61] Other data sources used by BC Stats to construct the local area dependencies (in addition to Census data) include Tourism BC's Visitor Survey, the BC Input-Output Model, Statistics Canada's Survey of Household Spending, and Canada Revenue Agency tax filer information.

[62] The various local area economic dependency tables are available at: www.bcstats.gov.bc.ca/pubs/econ_dep.asp

Estimates of multipliers for forestry for some selected local areas are provided in the following table. (Multipliers for other basic sectors are also available from BC Stats.)

Table 10. Forestry Employment Multipliers for Selected Communities, 1996 and 2001

	1996			2001		
	Logging	**Wood Products Manufacturing**	**Pulp & Paper**	**Logging**	**Wood Products Manufacturing**	**Pulp & Paper**
Ft. St. John	1.30	1.33	1.66	1.21	1.48	1.97
Prince George	1.40	1.40	1.81	1.34	1.56	2.10
Prince Rupert	1.41	1.35	1.67	1.28	1.44	1.90
Williams Lake	1.34	1.37	n/a	1.24	1.43	1.83
Campbell River	1.39	1.32	1.60	1.38	1.41	1.88
Squamish	1.40	1.32	1.72	1.32	1.47	1.94
Kamloops	1.39	1.35	1.79	1.36	1.46	2.17
Kelowna	1.42	1.34	1.69	1.38	1.41	1.97
Nelson	1.35	1.37	1.82	1.27	1.44	1.95

Note: Multipliers are calculated as (direct+indirect+induced) / direct.
Source: G. Horne, *BC Local Area Economic Dependencies – 1996*, Government of British Columbia (BC Stats), 1999, pages 32 and 33. Also, G. Horne, *British Columbia's Heartland At the Dawn of the 21st Century, 2001 Economic Dependencies and Impact Ratios for 63 Local Areas*, BC Stats, 2004, pages 29 and 30, available at: /www.bcstats.gov.bc.ca/pubs/econ_dep.asp

The above "no-migration" multipliers assume that incomes of unemployed workers are supported by Employment Insurance and other social assistance, and also assume that changes in direct employment do not result in migration into or out of the plan area. BC Stats also estimates "migration" multipliers that are appropriate when it seems clear that migration out of (in the case of direct job loss) and into (in the case of direct job gains) the plan area is likely to occur. It is appropriate to use "migration" multipliers when the size of the impact is proportionately large compared to the size of the community affected. "Migration" multipliers are typically higher than "no-migration" multipliers.

Applying the estimated multiplier to the direct effects derives the total income and employment effects. For example, Table indicates that the local area multiplier for logging jobs in Fort St. John is 1.21 (2001 estimate). This means that each logging job is associated with an estimated 0.21 indirect and induced jobs in the Fort St. John area.

As indirect and induced effects can change over time, impacts in the short and long-run should be separately identified, along with an indication and explanation of the range and nature of uncertainty in the estimates. The significance of such impacts may be more clearly understood if presented in both absolute terms and as a proportion of the industry and community workforce.

Finally, we note that there are uncertainties associated with the census statistics on which the multipliers are based, especially when small numbers of survey respondents were involved. This reinforces the need to view the multiplier estimates as rough indications only.

APPENDIX 10
PROVINCIAL ECONOMIC DEVELOPMENT IMPLICATIONS

The evaluation of the provincial direct, indirect and induced employment and income impacts involves evaluation principles similar to those presented above, with the added consideration of direct and indirect/induced effects that occur outside the plan area. Three steps are involved:

1. Identifying industries or activities outside the plan area that are directly dependent on resources in the area due to inter-regional flows of resources (e.g. log trading, downstream processing).
2. Estimating the impact of the management scenarios on production, income and employment of these directly dependent industries or activities outside the area.
3. Applying estimates of provincial income and/or employment multipliers to the direct income and employment impacts both within and outside the area to obtain an estimate of the total provincial impacts.

We note that the above methodology generates estimates of "gross" economic income and employment impacts that assume that factors of production such as labour do not have alternative uses in the provincial economy. We suggest that, where practical, analysts attempt to estimate incremental impacts, or to qualify the estimates of gross impacts, after taking into account alternative employment opportunities for labour within the province.

Identifying Linked Provincial Activities

Resource-dependent industries or activities outside the plan area generally consist of industrial downstream activities (e.g. wood manufacturing, natural gas processing, mineral smelting), complementary activities (e.g. multi-destination tourism), or resource migration (e.g. ocean fisheries). For harvesting-related industries like forestry or fisheries, resource flows must be traced to identify the direct dependence on resources in the plan area. For the tourism industry, identifying direct dependence outside the plan area requires consideration of the type of tourism that takes place within the plan area and its relationship to tourism in other areas.

The assessment for all sectors must also consider the extent to which total provincial activity is affected or simply being diverted or redistributed within the province. For example, a resource management scenario may not affect the number and spending of visitors from outside the province, at least in the short to medium term, but may affect where they visit in BC. Consultation with industry and government specialists will likely be the main source of this information.

Provincial Direct Effects

To estimate the effects on direct employment and income outside the plan area, the nature and extent of the linkage between the affected industries and the resources in the area must first be considered (e.g. plan area exports of resources for further processing in BC). The estimated impacts of the land and/or resource management

scenarios on the relevant resources can then be used to estimate production effects. Resource utilisation or migration models may be available to assist in this estimation.

For example, salmonid enhancement production models can be used to estimate the extent and location of fish harvesting and processing impacts. Where such models are not available, consultation with industry or resource specialists would be required.

To estimate income and employment effects, the production impacts can be multiplied by estimates of the provincial level income and employment generated per unit of production (see discussion under the Economic Development assessment). This analysis should also take into account any affected workers who reside outside the plan area but work in the plan area (e.g. in log harvesting, mining exploration, and tourism lodges).

Provincial Indirect and Induced Effects

An estimate of the total provincial direct effects of each management scenario can be obtained by summing the estimated direct income and employment impacts outside the plan area with the direct impacts within the plan area. Multiplying these direct effects by provincial level income and/or employment multipliers will then indicate total income and employment effects in the province (i.e. direct plus indirect and induced). The calculation method is as follows:

	Direct Impacts Within Plan Area
+	Direct Impacts Outside Plan Area
=	TOTAL Direct Effects (i.e., effects in all industries directly dependent on area's resources)
X	Multiplier Estimate $\frac{\text{(Total Direct + Indirect + Induced)}}{\text{Direct Effects}}$
=	TOTAL PROVINCIAL EFFECTS

We consider provincial multipliers generated by the BC Input-Output Model (BCIOM) to be the most appropriate source for the estimation of provincial indirect and induced effects. Estimates of multipliers are provided in the publication *BC Provincial Economic Multipliers & How to Use Them* (BC Stats, 2001).[63]

Regarding the forest industry, in 2005 BC Stats presented revised provincial employment ratios for Wood Products, Paper Products, and Forestry and Logging.[64] The revised employment ratios were especially prepared to avoid double-counting between the sub-sectors.[65] (Analysts must therefore use each of the employment ratios independently to get a total estimate of economic impacts for the whole forest sector.) Tables 3, 4, and 9 in the BC Stats paper provide the following employment ratios.

[63] www.bcstats.gov.bc.ca/pubs/pr_pem.asp
[64] See *Estimating Economic Impacts for the British Columbia Forest Sector Based on the 2001 British Columbia Input Output Model* (Dr Garry Horne for BC Stats, October 2005), at www.bcstats.gov.bc.ca/pubs/econ_dep.asp
[65] For example, the output of the "logging" sub-sector is an input for the "wood products" sub-sector.

Employment Ratios

	Direct	Own Indirect	Total Indirect	Safety-Net Induced
Wood Products	**3.19**	**0.29**	**2.04**	**0.93**
Paper Products	**2.66**	**0.05**	**2.21**	**0.87**
Forestry and Logging	**4.82**	**0.35**	**3.48**	**1.49**

From these employment ratios it is possible to derive the following employment multipliers:

Employment Multipliers

Sub-Sector	Multiplier
Forestry and Logging	**1.89**
Wood Products	**1.93**
Paper Products	**2.16**

The multipliers are calculated by dividing the total employment ratio (direct + total indirect + safety-net induced) by the direct employment ratio. For example, in the case of Forestry and Logging:

1.89 = (4.82 + 3.48 + 1.49) / 4.82

The multiplier of 1.89 indicates that each PY of direct employment is associated with an additional 0.89 PY of indirect/induced employment.[66]

As noted in Section 3.1.2 and in Appendix 9, above, there are limitations associated with the use of economic multipliers, particularly at the provincial level. We ask that analysts be aware of those limitations and report them appropriately in their work.

[66] The portion of the multiplier related to induced employment is based on the assumption that if forest sector employment were to decline, the displaced workers would receive employment insurance and other social assistance payments, and so would continue to support induced employment through local re-spending, albeit at lower levels than when they were employed.

APPENDIX 11
NET ECONOMIC VALUE METHODOLOGIES

The following tables show how an analyst might estimate the Net Economic Value (discussed in Section 3.5) for the forestry, mining, agriculture, tourism, and recreation sectors. The tables also briefly describe the rationale for the estimates. Data sources for Net Economic Value are discussed in Appendix 14.

Table 11. Example of Net Economic Value for Key Industrial Sectors

	Public Sector Rent	Example of Labour Rent	Example of Industry Rent
Forestry	Average stumpage over one business cycle after inflation	5% of total direct payroll in logging and manufacturing activities mainly to reflect the relatively high wages in that sector	Assumed to be minimal; between 1995 and 1999, the BC forest industry reported earnings that might be considered to be below a "reasonable average return".
Mining	Mining and mineral taxes	5% for direct payroll in mining sector mainly to reflect the relatively high wages in that sector	Assumed to be minimal; between 1991 and 2000, the BC mining industry reported losses in 6 of the 10 years, therefore below what might be considered a "reasonable return on capital"
Agriculture/ Ranching	Range fees	5% for direct payroll; while wages are relatively low there may be additional social benefits associated with local employment	Assumed to be minimal.
Tourism - guide-outfitting - guided angling - adventure tourism	Various licensing and other fees	5% for direct payroll; although wages are relatively low, there may be additional social benefits associated with local employment	Assumed to equal 5% of total industry revenues, to reflect the fact that the backcountry tourism sector may be extracting economic rents from the exceptional natural setting of BC

Table 12. Example of Net Economic Value for the Recreation Sector

Recreation Activity	Recreation Days	Expenditures per Day
Resident Hunting	hunter days	$50 - $100
Resident Angling	angling days	$90
Snowmobile Activities	recreation/visitor days	non-locals: $85 to $225 per day
Camping	camping visits	Not available
Non-Motorised & Other	recreation/ visitor days	$45
Total Recreation Days	Total days	
Recreation	**Net Economic Value / Additional Willingness-To-Pay[1]**	
Depends on Activity and Source of Data	BC WLAP estimates values in the range $50 - $150; Environment Canada survey estimates values in the $10 to $20 range	100,000 days @$10 per day yields $1 million; @$50 per day yields $5 million

Note: (1) For recreation, Net Economic Value represents willingness-to-pay over and above users' costs.

APPENDIX 12
TOOLS FOR ENVIRONMENTAL RISK ASSESSMENT

Habitat Supply Modelling

Although the development of spatial habitat supply models is improving, their application to land and/or resource management assessments that cover large geographic areas (millions of hectares) and long time frames (hundreds of years) remains limited. However, development of landscape-level habitat supply models, e.g. SELES (Spatially Explicit Landscape Event Simulator) or TELSA (Tool for Exploratory Landscape Scenario Analysis) can provide useful insights into potential consequences of forest development planning at sub-regional planning scales.

In the absence of these types of habitat supply models, surrogate models can be developed using existing databases and timber supply models. As an example, the availability of mature and old forests over time can be extracted from the timber supply runs using FSSIM. This may be most helpful for mature and **old growth** dependent species (e.g. marten). The availability of mature and old forests over time could be further broken down by biogeoclimatic subzone / variant and contributing (THLB) and non-contributing landbases. If these tools are used, however, it is critical to describe the relative importance of habitats that occur on the THLB relative to habitats that occur outside the THLB (i.e. non-contributing areas).

The amount of mature and old forest that occurs in non-contributing areas is often assumed to simply grow old with time. Incorporating natural disturbance regimes (fire, insect, windthrow) is recommended as it provides a more realistic view of forested habitat availability over time.

Area Analysis – Alternative Approach

In the absence of habitat supply models or surrogate models for key values, analysts may have to rely solely on static area summaries of habitat generated by a Geographic Information System (GIS). For LRMPs, these GIS summaries could be used to determine how much habitat occurs in each Resource Management Zone (RMZ) category (e.g. hectares of habitat in Parks, Special, General, Enhanced Timber Zones) for selected environmental values. The main indicator used to assess each environmental value is the percentage of habitat indicator occurring in each of the RMZ categories. To facilitate the interpretation of the area analysis, it is very important that the management objectives and strategies are taken into account explicitly, reflect the RMZ intensity level (e.g. a Special Resource Management Zone can be differentiated from a General RMZ), and are clearly differentiated from base case management strategies.

Typically, wildlife habitat **suitability maps** (1:250,000) would be developed by BC Environment for various species of management concern. The wildlife maps usually depict areas of high, moderate, and low habitat values within the plan area and depending on the relative abundance of each habitat rating class, the high or high/moderate suitability classes could be used as the primary habitat-based indicator.

Within each Resource Management Zone, the land base may be further broken down into areas potentially available for logging (i.e. THLB), forested areas presently excluded from logging (i.e. "forested exclusions") and non-forested areas. These area summaries can provide useful insights on the potential impacts of logging. We note that while forest areas in the operating landbase outside the THLB generally have a lower probability of being logged than areas inside the THLB, such areas should not be treated as protected areas in the analysis (i.e. it cannot be assumed that environmental values would not be disturbed).

The potential impact of other industrial or commercial activity on the environment such as mining and commercial backcountry recreation also needs to be addressed. In these instances, considering the "non-contributing" landbase also becomes important and the amount of gross habitat should be used as the primary indicator. Depending on the types of resource development activities in the plan area, other possibilities include intersecting wildlife habitat suitability maps with high mineral or tourism capability maps to determine the degree of conflict and hence potential risk.

Although the primary shortcoming of this approach is the inability to *quantitatively* forecast habitat availability over time (i.e. habitat supply), the area analysis can be used *qualitatively*, for example to conclude that mature and old growth habitat that occurs in an Enhanced Timber Zone will decline over time and is likely incompatible with maintaining old growth dependent species. Other limitations of the area analysis approach are related to the resultant area statistics themselves.

Analysts must be cautious when interpreting seemingly small overlaps between wildlife habitat and the timber harvesting land base. This is particularly important for those species that have distinct seasonal habitat requirements (e.g. Grizzly Bear) and depend on areas that may only occur in valley bottoms. Thus, although the total amount of habitat at risk may be small, the seasonal habitats may be disproportionately affected.

This kind of shortcoming can be avoided if fish and wildlife habitat mapping is developed to identify the distribution of specific seasonal habitats (e.g. spring feeding) or life requisites (e.g. nesting, spawning habitat). Similarly, caution must be exercised when interpreting the amount of habitat area that falls outside the timber harvesting land base. Although, some of these excluded areas can be viewed as land that contributes to the overall maintenance of biodiversity, their ability to function ecologically is related to their areal extent (i.e. patch size) and how they are spatially distributed over the landscape. That is, although the cumulative area may be large, this does not necessarily imply that these areas are all functioning as natural and viable ecosystems. Furthermore, human disturbance and resource development activities that occur within the timber harvesting land base itself can reduce the suitability of excluded areas, depending on their proximity.

In addition, some management objectives and strategies may apply to the whole plan area, limiting the interpretation of resource management zones.

APPENDIX 13
ECONOMIC "BUILDING BLOCKS" REPORTS

The Ministry of Agriculture and Lands "Building Blocks" are short reference papers containing concise financial, operational, and regulatory information for a range of resources-based business operations. The building blocks can be accessed at: www.al.gov.bc.ca/clad/strategic_land/econ_analysis/data_sources

Table 13 provides an outline of the content.

Table 13. Building Blocks Outline

Elements	What is Covered
Overview	
Brief description of the economic activity covered by the building block (sector/sub-sector)	• The business that uses the resource • The associated businesses that provide materials and other inputs into the business that uses the resources
Identification of the relevant geographic unit/area	• The geographic area for which the building block would be considered representative (e.g. the activity under discussion may be different on the coast than in the interior)
Land / Resource Requirements	
Overview of the coast and land resource inputs that are needed to support the economic activities	• Crown resources that must be accessible and usable • May include rangeland, viewscapes, foreshore access, critical thresholds (level of resource use); and complementary or conflicting relationships with other resource values
Investment Requirements	
An overview of the level of investment required to start and maintain the business	• Start-up costs and ongoing costs • Future capital requirements (improvements etc.)
Infrastructure	
Overview of the physical infrastructure that the businesses depend on	• Transportation, energy, communications, etc
Market	
Overview of the general market for the products and services produced	• Location of the market (domestic/export) • Access to the market (access costs, other market barriers) • Market demand
Labour Market	
Overview of labour market requirements	• Skill requirements, wage rates, employment generated (person years), seasonality/intensity of the job (hours/year)
Capacity	
Potential/capacity for growth/expansion	• Resource availability
Regulatory Regime	
Overview of the regulatory regime that governs activity in the business or the use of resources that the business depends on	• Time taken to gain approval for use of land and resources • Restrictiveness of the regulatory regime • Opportunities offered by the regulatory regime
Government Revenues	
Overview of the types of government revenues generated	• Provincial, municipal, and other revenues
Indicators Table	
Overview of inputs and outputs	• Inputs required to support the activity • Outputs resulting from the activity • Ratios showing economic activity/resource consumption relationships, e.g. such as employment per unit of consumed/produced resource • discussion of business viability thresholds and limits to growth

We suggest that analysts verify the applicability of Building Blocks information. While the Building Blocks are a readily available reference source, the information may not be current and the "averages" provided may not be representative of specific businesses or situations under consideration in particular socioeconomic assessments.

The following building blocks are available:

Agriculture
Beef Production

Aquaculture
Beach Shellfish, Deepwater Shellfish, Net Pen Finfish, Bibliography - Aquaculture & Marine Resource Studies

Forestry
Conventional Logging, Heli-Log Drop, Log Sort, Inter-tidal Log Storage, Logging Camp, Small Business FEP Logging

Marine Activities
Tidewater Park, Marine Structures

Mining and Quarrying
Mineral Exploration, Coal Mining, Metal Mining, Industrial Minerals, High-Value Mineral Products, Construction Aggregates

Oil and Gas
Geophysical Exploration, Tenure & Drilling, Gathering & Production, Coal Bed Methane

Tourism and Recreation
Commercial Lodge, Cultural Interpretation, Guide Outfitting, Resident Hunting, Freshwater Guiding and Lodges, Freshwater Angling, Saltwater Fishing Lodges, Saltwater Fishing Charters, Saltwater Angling, Nature-Based/Ecotourism (Land-based) Overview, Cycling, Hiking, Horseback, River-Based, Winter Activities, Nature-Based/Ecotourism (Marine Based) Overview, Cruising, Sea Kayaking

Miscellaneous
Independent Power Producers

APPENDIX 14 DATA AND INFORMATION SOURCES

The following table lists useful of sources of data and information. In addition, consultation with government agencies, industry experts and non-government organisations can help analysts to find useful reports and data sources. Additional references are provided in Appendix 16.

Table 14. Data and Information Sources for SEEA

Data / Information Type	Document / Link	Source
GENERAL INFORMATION & DATA SOURCES		
General Land Use Planning		
• **Land and Resource Management Plans**	• *Regional Land Use Plans and Land and Resource Management Plans (LRMPs) in BC* http://srmwww.gov.bc.ca/rmd/lrmp/	• Integrated Land Management Bureau
• **Sustainable Resource Management Plans**	• *Sustainable Resource Management Plans (SRMPs) in BC and SRMP Online Training* http://srmwww.gov.bc.ca/rmd/srmp/index.htm	• Integrated Land Management Bureau
• **Resource Analysis Guide for Sustainable Resource Management**	• *Resource Analysis Guide for Sustainable Resource Management Planning* http://ilmbwww.gov.bc.ca/ilmb/lup/srmp/background/rag.html	• Integrated Land Management Bureau
Local and Provincial Statistics		
• **Census Data**	• *The Census of Canada* http://www.bcstats.gov.bc.ca/census.asp	• BC Stats
	• *The Census of Canada* http://www12.statcan.ca/english/census/index.cfm	• Statistics Canada
• **BC Regional and Community Profiles**	• *BC Regional Socio-Economic Profiles & Indices* http://www.bcstats.gov.bc.ca/data/sep/	• BC Stats
• **BC Provincial and Local Area Multipliers and Dependencies**	• *British Columbia's Heartland at the Dawn of the 21 st Century -- 2001 Economic Dependencies and Impact Ratios for 63 Local Areas (2004)* http://www.bcstats.gov.bc.ca/pubs/econ_dep/ed_full.pdf	• Gary Horne, BC Stats
	• *Employment and income dependency data for LRMP areas, Forest Districts, Health Service Delivery Areas, and Health Authorities (2004)* http://www.bcstats.gov.bc.ca/pubs/econ_dep.asp	• Gary Horne, BC Stats
	• *BC Provincial Economic Multipliers & How to Use Them (2005)* http://www.bcstats.gov.bc.ca/pubs/pr_pem.asp	• Gary Horne, BC Stats
• **Major Projects Inventory**	• *BC Major Projects Inventory* http://www.gov.bc.ca/bcgov/content/docs/@2O2CY_0YQtuW/mpi_june_06.pdf	• Ministry of Economic Development
• **BC Competition Council**	• http://www.bccompetitioncouncil.gov.bc.ca/	• BC Competition Council
• **Coast Information Team**	• http://www.citbc.org/	• Coast Information Team

Data / Information Type	Document / Link	Source
• **Business Employment, Market, Production, and Investment Information**	• Building Blocks for socio-economic analysis, prepared for approximately 50 sub-sectors (see Appendix 13). *http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html*	• Ministry of Agriculture and Lands, Strategic Land Policy and Legislation Branch
ECONOMIC DEVELOPMENT DATA SOURCES		
Forestry Data		
• **Timber Supply Reviews**	• *Timber Supply Reviews and rationales for AAC determinations* http://www.for.gov.bc.ca/hts/tsr.htm	• Ministry of Forests and Range, Forest Analysis and Inventory Branch
• **Wood Fibre Flows**	• *Analysis of Woodflow In The Coast Forest Region* (2003) http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/369529/	• Ministry of Sustainable Resource Management
• **Historical Timber Harvest Levels and Stumpage Rates**	• *Harvest Billing System (HBS)* http://www.for.gov.bc.ca/hva/hbs	• Ministry of Forests and Range, Revenue Branch
• **Industry Statistics**	• *Economics and Trade Branch, Ministry of Forests and Range* http://www.for.gov.bc.ca/het/	• Ministry of Forests and Range, Economics and Trade Branch
	• *Major Primary Timber Processing Facilities in British Columbia* http://www.for.gov.bc.ca/het	• Ministry of Forests and Range, Economics and Trade Branch
	• *Coast Forest Products Association* http://www.coastforest.org/	• Coast Forest Products Association
	• *The Forest Industry in British Columbia, 1999* (later years not available) http://www.cofi.org/reports/pdf/BCForest99.pdf	• PriceWaterhouseCoopers
	• "Building Blocks" for Forestry: Conventional Logging, Heli-Log Drop, Log Sort, Inter-Tidal Log Storage, Logging Camp, and Small Business Logging *http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#for*	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
Mining and Energy Data		
• **Mineral Occurrences and Mineral Potential (industrial and metallic)**	• MINFILE Database http://www.em.gov.bc.ca/Mining/Geolsurv/Minfile/default.htm	• Ministry of Energy, Mines and Petroleum Resources
• **Mining Industry Statistics**	• *The Mining Industry in British Columbia – 2005* (also 1998-2004) http://www.pwc.com/extweb/pwcpublications.nsf/docid/164E17600B2FB96A852570CA00178DBA	• PriceWaterhouseCoopers
	• Ministry of Energy, Mines and Petroleum Resources, Mineral Exploration and Mining http://www.em.gov.bc.ca/Publicinfo/default.htm	• Ministry of Energy, Mines and Petroleum Resources
	• Ministry of Energy, Mines and Petroleum Resources, Mining Statistics http://www.em.gov.bc.ca/Mining/MiningStats/	• Ministry of Energy, Mines and Petroleum Resources

Data / Information Type	Document / Link	Source
	• "Building Blocks" for Mining and Quarrying: Mineral Exploration, Coal Mining, Metal Mining, Industrial Minerals, High-Value Mineral Products, Construction Aggregates http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#mine	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
• **Oil and Gas Industry Statistics**	• Royalties, volumes, and reserves http://www.em.gov.bc.ca/subwebs/oilandgas/stat/stat.htm	• Ministry of Energy, Mines and Petroleum Resources
	• Ministry of Energy, Mines and Petroleum Resources, Oil and Gas Division http://www.em.gov.bc.ca/subwebs/oilandgas/overview/overview.htm	• Ministry of Energy, Mines and Petroleum Resources
	• "Building Blocks" for Oil and Gas: Geophysical Exploration, Tenure & Drilling, Gathering & Production, Coal Bed Methane http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#oil	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
• **Energy Production**	• "Building Blocks" for Independent Power Producers http://www.test.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#misc	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
Tourism and Recreation Data		
• **Provincial Tourism Indicators**	• Tourism BC http://tourismbc.com	• Tourism BC
• **Tourism Use and Opportunities**	• Tourism Opportunities Studies for 25 regions in British Columbia http://ilmbwww.gov.bc.ca/cis/initiatives/tourism/	• Ministry of Agriculture and Lands, Integrated Land Management Bureau
	• *Characteristics of the Commercial Nature-Based Tourism Industry in British Columbia* (Wilderness Tourism Association and Tourism BC, 2005) http://tourismbc.com/PDF/Characteristics%20of%20Commercial%20Nature-Based%20Tourism.pdf	• Tourism BC
• **Recreation Use**	• *British Columbia 's Hunting, Trapping & Wildlife Viewing Sector* http://www.bcstats.gov.bc.ca/data/bus_stat/busind/fish/wildlife.pdf	• BC Stats
	• *The Guide Outfitting Industry in BC: An Economic Analysis of 2002* (Pacific Analytics, 2003) http://www.goabc.org/04admin/Guide%20Outfitter%20Report%20-%20Final%20Report.pdf	• Pacific Analytics
	• Hunting and Fishing: harvest statistics and level of effort http://www.env.gov.bc.ca/fw/wild/synopsis.htm	• Ministry of Environment, Fish and Wildlife Branch
	• Economic Impact Analysis of Outdoor Recreation on British Columbia's Central Coast, North Coast and Queen Charlotte Islands/Haida Gwaii (Economic Planning Group, Juan De Fuca Environmental Consultants, Darlene Anderson, 2003) http://www.orcbc.ca/research_pub.htm	• Outdoor Recreation Council of British Columbia
	• *The Economic Value of Wildlife Activities in British Columbia, 1996*, (Roger Reid, 1998)	• Ministry of Environment, Fish and Wildlife Branch

Data / Information Type	Document / Link	Source
	• *The Importance of Nature to Canadians: The Economic Significance of Nature Related Activities* http://www.ec.gc.ca/nature/tofC.htm	• Environment Canada
• **Building Blocks**	• "Building Blocks" for Tourism and Recreation – Commercial Lodge, Cultural Interpretation; Hunting and Fishing; Nature-based/Ecotourism (land-based and marine-based) http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#rec	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
Agriculture Data		
• **Census of Agriculture**	• Census of Agriculture http://www.statcan.ca/english/agcensus2001/index.htm	• Statistics Canada
• **Building Blocks**	• "Building Blocks" for Agriculture: Beef Production http://www.test.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#ag	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
Aquaculture Data		
• **Building Blocks**	• "Building Blocks" for Aquaculture: Beach Shellfish, Deepwater Shellfish, Net Pen Finfish, Bibliography-Aquaculture & Marine Resource Studies http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#aqua	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
Non-Timber Forest Products Data		
• **BC Data and Information**	• *Seeing the Forest Beneath the Trees: The Social and Economic Potential of Non-Timber Forest Products and Services in the Queen Charlotte Islands/ Haida Gwaii*, (Tedder, Mitchell and Farran, 2000) http://www.for.gov.bc.ca/het	• Ministry of Forests and Range, Economics and Trade Branch
Fishing, Trapping and Hunting Data		
• **General Data**	• Ministry of Environment, Fish and Wildlife Branch http://www.env.gov.bc.ca/fw/index.html	• Ministry of Environment, Fish and Wildlife Branch
Other Marine Activities Data		
• **Building Blocks**	• "Building Blocks" for Marine Activities: Tidewater Park, Marine Structures; Commercial Lodge; Inter Tidal Log Storage http://www.agf.gov.bc.ca/clad/strategic_land/blocks/index.html#marine	• Ministry of Agriculture and Lands, Strategic Land Policy Branch
COMMUNITY AND SOCIAL DATA SOURCES		
• **BC Stats Data**	• Social Statistics http://www.bcstats.gov.bc.ca/data/lss/social.asp	• BC Stats
	• Socio-Economic Indices http://www.bcstats.gov.bc.ca/data/sep/choose_i.asp	• BC Stats
	• Socio-Economic Profiles http://www.bcstats.gov.bc.ca/data/sep/choose.asp	• BC Stats
	• Regional Statistics http://www.bcstats.gov.bc.ca/regions.asp	• BC Stats

Data / Information Type	Document / Link	Source
	• Population and Demographics http://www.bcstats.gov.bc.ca/data/pop/popstart.asp	• BC Stats
• **Community Stability Indicators**	• *Indicators of Community Sustainability for the Morice and Lakes IFPA Region* (MacKendrick and Parkins, 2004) http://www.moricelakes-ifpa.com/publications/documents/SocIndReport_maintext.pdf	• Morice-Lakes IFPA and Canadian Forest Service
• **Coast Information and Data**	• Coast Information Team http://www.citbc.org/	• Coast Information Team
• **BC Local Governments**	• Links to BC local governments http://www.civicnet.bc.ca/siteengine/ActivePage.asp?PageID=83&bhcp=1	• CivicNet BC
FIRST NATIONS DATA SOURCES		
• **BC Stats**	• BC Stats: Aboriginal Peoples of British Columbia http://www.bcstats.gov.bc.ca/data/lss/abor/ap_index.asp	• BC Stats
• **Canadian First Nations Profiles**	• INAC: First Nations Profiles http://pse2-esd2.ainc-inac.gc.ca/FNProfiles/FNProfiles_home.htm	• Department of Indian and Northern Development
• **First Nations Statistical Institute**	• First Nations Statistical Institute http://www.firststats.ca/	• First Nations Statistical Institute
• **Archaeological Data**	• Archaeological data on sites and other information http://www.tsa.gov.bc.ca/archaeology/	• Ministry of Tourism, Sport, and the Arts, Archaeology Branch
ENVIRONMENTAL RESOURCES DATA SOURCES		
• **Species at risk (red and blue listed species)**	• BC Species and Ecosystems Explorer http://www.env.gov.bc.ca/atrisk/toolintro.html	• Ministry of Environment, Ecosystems Branch
	• Species listed on *Species at Risk Act* (Sch. 1) http://www.sararegistry.gc.ca/default_e.cfm	• Government of Canada, Species at Risk Public Registry
	• Species listed under the *Wildlife Act* http://www.qp.gov.bc.ca/statreg/reg/W/Wildlife/168_90.htm	• Ministry of Environment/ Queen's Printer
	• Species-at-Risk under the *Forest and Range Practices Act* (FRPA) http://www.env.gov.bc.ca/wld/frpa/iwms/accounts.html	• Ministry of Environment, Ecosystems Branch
• **Biogeoclimatic Maps**	• BECWEB http://www.for.gov.bc.ca/hre/becweb	• Ministry of Forests and Range, Research Branch
• **Ecosystem Maps**	• Terrestrial & Predictive Ecosystem Mapping http://www.env.gov.bc.ca/ecology/tem/index.html	• Ministry of Environment, Ecosystems Branch
• **Natural Disturbance Data**	• *Estimating Historical Variability of Natural Disturbances in British Columbia* (Wong, Sandmann, and Dorner, 2003) http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh53.pdf	• Ministry of Forests and Range, Resource Planning Branch
• **Environmental Valuation**	• Ecosystem Valuation http://www.ecosystemvaluation.org/ (A non-technical introduction to ecosystem valuation concepts, methods, and applications.)	• Profs. Dennis King and Marisa Mazzotta

Data / Information Type	Document / Link	Source
	• Environmental Valuation Reference Inventory http://www.evri.ec.gc.ca/english/default.htm (EVRI is a searchable storehouse of empirical studies. Canadian residents can subscribe at no charge.)	• Environment Canada
	• Gund Ecosystem Services Database http://esd.uvm.edu/	• Gund Institute for Ecological Economics, University of Vermont
	• IUCN/WWF Biodiversity Economics http://biodiversityeconomics.org/	• World Conservation Union (IUCN) and World Wildlife Fund (WWF)
	• World Bank Environmental Valuation http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEEI/0,,contentMDK:20998765%7EmenuPK:2770701%7EpagePK:210058%7EpiPK:210062%7EtheSitePK:408050,00.html	• World Bank, Environment Department
	• KATOOMBA'S Ecosystem Marketplace http://www.ecosystemmarketplace.com/	• The Katoomba Group, Forest Trends

APPENDIX 15 GLOSSARY

Area Analysis: Using a Geographic Information System (GIS), this involves the generation of area-based statistics by overlaying mapped values upon one another in a computer database. This analysis is used in the assessment work to provide the hectarage of each resource value (e.g., Grizzly Habitat, Timber Harvesting Land Base, etc.) in each resource management zone (e.g. Special Management, General, Agriculture-Settlement, and Protected Areas).

Basic and Non-Basic Income/Employment: Basic Income is assumed to flow into a local economy from outside that economy, and can consist of incomes received from selling goods (e.g., forest products) and services (e.g., tourism) to non-local markets, or can take the form of government expenditures (e.g. public servant incomes, pensions, social assistance) and investment income (e.g. bank interest) accruing to community members. Non-Basic Income is paid to individuals in the local economy for the goods/services they provide to workers and companies in the "basic" sector (e.g. most retail activity). Basic Employment consists of the jobs in the Basic Sectors (normally including Forestry, Mining, Tourism, Agriculture, Fishing/Trapping, and Construction) and "Non-Basic" Employment consists of jobs in the Non-Basic Sector (e.g. most retail and personal services)

BC Input-Output Model (BCIOM): Model developed by BC Stats which comprises a detailed set of BC industry/commodity accounts accounting data that simulate the structure of the BC economy via a set of equations that describe the relationships among sectors. A major use of the model is to provide quantitative estimates at the provincial level of the indirect and induced employment impacts caused by a change in the output of a particular sector, e.g. forestry.

Base Case: The socio-economic and environmental trends, as well as the implications of the land management regime in a planning unit, that are most likely to occur in the absence of a land use plan. It is usually considered the "benchmark" to which a proposed land or resource management plan is compared in order to assess implications.

Biodiversity (Biological Diversity): The diversity of plants, animals, and other living organisms in all their forms and levels of organization, including genes, species, ecosystems, and the evolutionary processes that link them.

Biogeoclimatic Classification System: A hierarchical system of ecological classification combining 3 classification themes: climatic, vegetation and site by utilizing climate, and vegetation/soils data to produce a classification of ecosystems at regional to local levels.

Biogeoclimatic Unit: Named units in this hierarchical classification of ecosystems represent unique combinations of climate and flora at regional to local levels. The main divisions in the hierarchy of ecosystem classification at the regional level are:

- *Zones* - broad regional macroclimate and vegetation, e.g., Sub-Boreal Spruce Zone (SBS)
- *Subzones* - regional climate/vegetation assemblages, e.g., Dry Warm Subzone - (SBSdw)
- *Variants* - sub-regional climate, e.g., Stuart Variant (SBSdw3)

Blue-List: BC Conservation Data Centre list of ecological communities and indigenous species and subspecies of special concern (formerly “vulnerable”). Blue-listed species are considered to be of special concern and "at risk" but not yet endangered or threatened. Populations of these species may not decline but their habitat or other requirements are such that they are sensitive to further disturbance. The blue-list also includes species that are generally suspected of being vulnerable, but existing information is inadequate to determine their status.

Capability Mapping: An interpretation of the level of capability of an area to provide optimal conditions for a given species, usually represented as High, Medium and Low. Typically based on climate and broad vegetation patterns. The present habitat condition or successional stage is not considered. In other words, capability is defined as the *potential* value of a habitat under optimum seral stage and management conditions.

Consumer Surplus: The amount that consumers are willing to pay to obtain a good or service in excess of what they actually have to pay.

Direct Impacts: The change in income/employment that occurs as a direct result of a change in industry activity, e.g. mill jobs affected due to a change in timber processed in that sawmill.

Ecological Community: A term used by the BC Conservation Data Centre and NatureServe to include natural plant communities and plant associations and the full range of ecosystems that occur in British Columbia. These may represent ecosystems as small as a vernal pool, or as large as an entire river basin, an Ecoregion or a Biogeoclimatic Zone.

Economic Impact Analysis: An analytical technique that estimates the impacts of a land or resource management plan or initiative on income and employment in specific communities, regions, or the province as a whole.

Economic Rent: The above-normal financial returns from a commercial activity that occur as a result of the product or service generated by that activity being in relatively fixed supply relative to demand. Rent can accrue to the entrepreneur, or can be captured in the form of taxes by government or as wages by labour. Rents are estimated as the total sales revenues less all private and public costs of production, and less any external costs imposed on third parties.

Ecoregion Classification: The ecoregion classification system is used to stratify BC's unique terrestrial and marine ecosystems into discrete geographical units at five different levels. The two highest levels, Ecodomains and Ecodivisions, are very broad and place BC globally. The three lowest levels, Ecoprovinces, Ecoregions and Ecosections, describe progressively smaller areas of the Province with similar terrain, climate, vegetation and wildlife potential.

Ecosection: The finest level in the hierarchy of the Ecoregional Classification System, which describe areas with minor physiographic, climatic and oceanographic differences. Each ecosection has a unique subset of biogeoclimatic sub-zones and are at a level sufficient to capture the ranges of sub-populations of larger wildlife species.

Ecosystem: A functional unit consisting of all living organisms (plants, animals, and microbes) in a given area, together with the non-living physical and chemical features of their environment, which are inter-connected through nutrient cycling and energy flow. An ecosystem can be of any size - a log, pond, field, forest or the earth's biosphere. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, old-growth ecosystem, or range ecosystem.

Ecosystem Integrity: The soundness or wholeness of the processes and organisms composing the ecosystem.

Endangered: Facing imminent extirpation or extinction.

Employment Coefficient or Ratio: The number of person-years of direct forestry employment associated with the timber harvest for a particular area, divided by that harvest volume. The result provides the ratio of person-years of employment associated with each 1,000 cubic metres of timber harvest.

Existence Value: The value derived by people from knowing that something exists (e.g., wilderness), even if they do not intend to use it.

Extinct: Species that no longer exist.

Extirpated: Taxa that no longer exist in the wild in British Columbia, but occur elsewhere. Ecological communities that no longer exist in British Columbia, but do occur elsewhere.

Habitat: The specific environmental conditions under which an organism lives, which is usually determined by the presence and relative abundance of a particular subset of dominant features (vegetation, water) on which it thrives.

Indirect Impacts: The change in income/employment of workers in businesses that supply goods or services to the firm or sector that is experiencing the direct impacts, e.g. a change in machine shop employment due a change in sawmill activity.

Induced Impacts: The change in income/employment of workers in businesses that rely on purchases of goods/services from wage-earners in the direct and indirect sectors experiencing the impacts, e.g., variations in motor vehicle sales to workers due to changes in sawmill or machine shop activity.

Inoperable Lands: Lands that are unsuitable for timber production now and in the foreseeable future by virtue of their: elevation; topography; inaccessible location; low value of timber; small size of timber stands; steep or unstable soils that cannot be harvested without serious and irreversible damage to the soil or water resources; or designation as parks, wilderness areas, or other uses incompatible with timber production.

Long Term: For economic analysis, the time period after which the entrepreneur has the ability to alter the capital stock (i.e. plant and equipment), typically about 2-3 years. In socio-economic analyses, the long run generally implies more than one decade. For environmental values, the long run is typically a much greater period of time. For timber supply analysis, the "long term" is usually at least several decades in the future.

Long Term Harvest Level (LTHL): The estimated annual harvest projection for unmanaged timber stands that is sustainable for an indefinite time period in a particular management unit, given that management constraints and other assumptions remain unchanged. The LTHL is based on the long term timber productivity of the management unit, and does not normally take into account the positive effects of managed silvicultural treatments on available timber volumes. In recent Timber Supply Reviews by the Ministry of Forests, the LTHL is assumed to occur between approximately year 80 and 180. See also Non-Declining Yield (NDY).

Multiplier: A variable that, when calculated in the form of a numerical estimate, provides a quantitative approximation of the indirect and induced income/employment impact caused by a prior direct change in income/employment. Multipliers are applied to the direct income/employment impacts in resource industries to estimate the total income and employment effects in both the plan area and the province overall. For example, an employment multiplier of 2.0 for forestry would mean that each direct forestry job is associated with one additional "spin-off" job. Provincial level multipliers are larger than local multipliers because at the local level a greater proportion of income "leaks" out of the area as people purchase goods and services in other towns.

Mineral Occurrences: Documented evidence of site-specific mineralisation. Occurrences are divided into Producing Mines, Past Producing Mines, Developed Prospects (occurrences with defined grades and tonnages), Prospects (occurrences with some indication of dimension), and Showings (occurrences that are not sufficiently defined to permit resource estimation.)

Mineral Potential: Mapped estimates of the areas of the land base that are judged by the Ministry of Energy, Mines and Petroleum Resources to have either "high", "medium", or "low" capabilities for producing future mineral discoveries.

Mitigation: A measure that reduces the negative impacts of a particular action.

Multi-Attribute Trade-Off Analysis (MATA): Multi-attribute trade-off analysis helps to demonstrate trade-offs and the potential relative importance of individual impacts or categories of impacts. Scores are assigned and subjective weights are chosen for each of the impact indicators. MATA can be particularly useful in complex assessments involving many indicators and scenarios, by providing a concise summary of impacts and their relative significance, and perspective on the overall balance between positive and negative implications.

Multiple Accounts Framework: A framework for presenting information on the socio-economic / environmental impacts associated with changes in land use or specific projects. The analytical framework is separated into various categories or "accounts" so that the reader can make comparisons among impacts on different values (e.g. forestry, wildlife, recreation, mining, communities) within a land use scenario or among various scenarios (the benchmark compared with the land use plan). This analysis is based primarily on the Area Analysis (see above) and Resource Analysis (see below) provided by provincial government agencies.

Natural Disturbance Type (NDT): Areas with different natural disturbance regimes. These disturbances typically initiate secondary succession in a repeating cycle of forest regeneration. The disturbance agents are mostly wild fires, wind storms and, to a lesser extent, insects and landslides. Five NDT's are identified within British Columbia – more information is provided in the Ministry of Forests and Range's *Landscape Unit Planning Guide*.

Net Economic Value: A provincial level socio-economic assessment also termed "Economic Efficiency", which estimates net benefit in terms of economic rents gained from production activities and consumer surplus gained from the use / existence of a certain good or service.

Net Present Value (NPV): The value in today's dollars of a future stream of cash payments, predicated on the concept that a dollar received in the present is worth more than a dollar received in the future, since funds received in the present will earn interest immediately. For example, the NPV of a dollar received a year from today is $1.00 / 1.06 = $0.94 if the interest rate (or "discount rate") is 6%, the NPV of a dollar received in 10 years would be $1.00 / $(1.06)^{10}$ = $1.00 / 1.79 = $0.56, and the NPV today of a dollar received in 30 years would be $1.00 / $(1.06)^{30}$ = $1.00 / $5.74 = $0.17.

Non-Timber Resource Values: Values within the forest other than timber which include but are not limited to biological diversity, fisheries, wildlife, water quality and quantity, recreation and tourism, cultural and heritage values, and wilderness and aesthetic values.

Old Growth Forest: Several definitions are possible depending on the forest type and

natural disturbance regime. Typical characteristics include: 1) moderate to high canopy closure, 2) a multi-layered, multi-species canopy, 3) a wide range in tree ages and sizes (including very large), 4) presence of large diameter standing dead and down-and-dead trees, and 5) the occurrence of decadence in the form of broken branches, limbs or tops, which create a variety of canopy openings. The Biodiversity Guidebook identifies age class targets by Natural Disturbance Type for old growth.

Operable Forests: The portion of the productive forest that, under the current market conditions, can be logged economically.

Person-Year (PY): One year of full-time work, e.g. one person working for 12 months or 2 people working 6 months. PY estimates are often used to facilitate comparisons of employment impacts among different sectors where seasonal jobs are an important component, e.g. in forestry, tourism.

Plan Area: Area covered by a land use plan.

Protected Areas (PAs): Land/water set aside from development by legislation in order to protect representative examples of the Province's natural diversity and special features.

Qualitative Assessment: An analysis in which an impact is described in words rather than using numbers, e.g. an unknown change in costs to a sector due to a land use change. Qualitative assessments are used primarily where there is too much uncertainty or complexity to have confidence in quantified estimates.

Quantitative Assessment: Where an impact is described by some change in the numerical value of a certain variable, e.g. an estimate of the change in government revenue occurring due to a land use change.

Red List: BC Conservation Data Centre List of ecological communities and indigenous species and subspecies that are extirpated, endangered or threatened in British Columbia. Red listed species and sub-species have – or are candidates for – official Extirpated, Endangered or Threatened Status in BC. Not all Red-listed taxa will necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.

Recreation Opportunities Spectrum (ROS): A Ministry of Forests inventory, which classifies the land base into various categories based on road density. ROS #1 (Primitive Non-Motorised) is defined as areas greater than 5,000 hectares and more than 8 kilometres from a 4-wheel drive road, ROS #2 (Semi-Primitive Non-Motorised) is defined as areas greater than 1,000 hectares and more than 1 kilometre from a 4-wheel drive road, and ROS #3 (Semi-Primitive Motorised) is defined as areas greater than 1000 hectares and more than 1 kilometre from a 2-wheel drive road. ROS #4 and #5 (Resource Roaded) constitute the remaining land base.

Reserve: An area of forest land that, by law or policy, is not available for timber harvesting. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation or rare species, gene pool, wildlife protection etc.

Resource Analysis: An analysis of the impacts on the physical units of a resource (e.g. m^3/yr of timber, tonnes of mineral production, wildlife populations) resulting from changes in land use. This analysis is usually provided by the provincial resource agencies (e.g. Ministry of Forests and Ranges' timber supply analysis) and is based primarily on the Area Analysis (see above).

Riparian: An area of land immediately adjacent to a stream, river, lake or wetland that contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas.

Short Term: In economic analysis, that period during which an entrepreneur does not have the time to vary the capital stock (i.e. plant and equipment), usually 2-3 years. In this socio-economic analysis, this term is utilised to describe that period covering the near future, e.g. within a single decade.

Short Term Harvest Level (STHL): The estimated annual timber harvest projection for a management unit that can be maintained from the present time for specific limited period, usually less than several decades, assuming management constraints remain unchanged. Since the STHL is based primarily upon the stock of available mature timber, there can in fact be an infinite number STHL's depending on how fast the harvesting of mature timber is assumed to occur.

Site Series: Sites with similar soil nutrient and moisture regimes that would support the same climax plant species association within sub-regional areas. Each site series unit is named using the dominant vegetation, e.g. Hybrid Spruce/Douglas Fir - Pinegrass (SBSdw3/01).

Social Impact Analysis: An analytical technique that identifies and assesses demographic, local government and community implications and concerns in response to a change.

Special Concern (vulnerable): Ecological communities and indigenous species and subspecies that are considered particularly sensitive to human activities or natural events but are not endangered or threatened. Special Concern was formally referred to as "vulnerable".

Species-at-Risk: A species that is considered to be at risk of being lost (or has been lost) from an area (extinct, extirpated, endangered, threatened, special concern).

a) Any wildlife species that, in the opinion of the Deputy Minister of Environment, Lands and Parks or a person authorised by the Deputy Minister is threatened, endangered, sensitive or vulnerable.
b) Any threatened and endangered plants or plant communities identified by the

Deputy Minister of Environment, Lands and Parks or any person authorised by that Deputy Minister, as requiring protection and

c) Regionally important wildlife as determined by the Deputy Minister of Environment, Lands and Parks or a person authorised by that Deputy Minister.

Suitability Mapping: An interpretation of the suitability of an area or habitat type to provide the greatest potential to support a given species. The present habitat condition or successional stage is considered and therefore suitability refers to the *current* seral stage and condition of the habitat.

Threatened or Endangered Species: Any indigenous taxon (species or sub-species) likely to become endangered if limiting factors are not reversed. Species identified by the Conservation Data Centre as red-list are candidates for legal designation as Endangered or Threatened.

Threatened or Endangered Plant Communities: Plant communities listed on the Conservation Data Centre red-list for various reasons such as: 1) they are rare on the natural landscape (e.g., floodplains), restricted to a specific geographic area or a particular type of local environment, or 2) were previously widespread or common but mature representative examples now occur over a much smaller area due to extensive disturbance or complete alienation by intensive silvicultural practices, grazing by introduced species, land development, and conversion for agriculture.

Timber Harvesting Land Base (THLB): That portion of the land base of a defined management unit (e.g., a unit such as a Forest District or Timber Supply Area) considered by the Ministry of Forests and Range to be available for long-term timber supply. Therefore, from the Gross Land Base, areas known as “Forested Exclusions” (e.g., non-merchantable timber) and Non-Forested Exclusions (i.e., alpine areas) are “netted out” in arriving at the THLB. It is assumed that Forested Exclusions generally contribute more to non-timber values, such as wildlife habitat, than do Non-Forested Exclusions. Note that the THLB often changes over time.

Timber Supply Model: A computerised analytical tool that, after inputting the appropriate data and assumptions (e.g. Timber Harvesting Land Base or growth rate of timber), provides forecasts of potential annual short and long term harvest levels over time.

Viability: The ability of a wildlife or plant population to maintain a sufficient size such that it persists over time despite natural fluctuations in numbers OR the ability of a habitat or complete ecosystem to remain useable by species or groups of species.

Visual Quality Objective (VQO): A management zone that defines a particular level of landscape alteration from timber harvesting. The objective for an area can range from Preservation VQO (where up to 1% of the landscape can be visibly altered by harvesting) to Modification VQO (where up to 25% of the visible area can be altered).

Watershed: An area of land that collects and discharges water into a single main stream through a series of smaller tributaries.

Wetland: A general term used to describe areas of land that are inundated by surface or groundwater for a long enough period of time to support vegetation that is distinct from adjacent upland areas and require saturated or seasonally saturated soils. Typical wetland types include swamp, marsh, bog and fen.

Wilderness: An area of land generally greater than 1000 hectares that predominately retains its natural character and on which the impact of man is transitory and, in the long run, substantially unnoticeable.

Wildlife: Any species of bird, fish, mammal, amphibian and reptile found in the wild living unrestrained and free-roaming and not domesticated.

Wildlife Habitat: Areas of land/water that support specific wildlife or groups of wildlife.

Wildlife Management: The application of scientific and technical principles to wildlife populations and habitats to maintain such populations (particularly mammals, birds and fish) essentially for recreational and/or scientific purposes.

APPENDIX 16 REFERENCES

This list of references includes those footnoted throughout the document, but does not repeat all the references provided in Appendix 14 (Data and Information Sources).

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