

**Socio-Economic and Environmental Impact Assessment for  
Land and Resource Management Planning  
in British Columbia**

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**A Review**

This review has been prepared for the  
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## Chapter One: Background to the Review

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### Land and Resource Management Plans (LRMPs)

The Land and Resource Management planning process has been underway in B.C. for several years. Plans have already been completed for seventeen sub-regional areas (or eighteen, if the East and West Kootenays are counted separately), most of which are contained within the B.C. Interior. However, plans remain to be completed for thirteen sub-regional areas, many of which are located along, or close to, the B.C. Coast or the Alaska panhandle. The Provincial Government aims to complete the land use planning process for these remaining sub-regional areas with good speed over the next few years.

The new streamlined approach to land use planning in B.C. has increased the importance of timely, succinct and reliable socio-economic and environmental impact assessments (SEAs) within the Land and Resource Management Planning (LRMP) process. In this context, the multiple accounts assessment (MAA) guidelines which govern the preparation of SEAs for use within the LRMP process have recently been revised. The request for proposals (RFP) calls for an academic review of these guidelines that is capable of answering a number of basic questions about the underlying MAA methodologies. This is such a review.

An overall provincial roll-up of the main socio-economic impacts of the Land and Resource Management Plans (LRMPs) that have been completed to date is contained within the following report:

Pierce Lefebvre Consulting (with Stuart Gale and Associates, and BriMar Consultants Ltd.), *Socio-Economic Impact Assessment of the Provincial Government's Strategic Land Use Plans on Key Sectors in British Columbia*, prepared for the Ministry of Sustainable Resource Management, Oct. 2001.

Our familiarity with the *Pierce Lefebvre et. al.* report has helped to inform the preparation of this review. In addition, various SEAs that have been prepared for individual LRMPs have also been studied as a background to this review. These include the SEAs prepared for the Fort Nelson, Prince George, Dawson Creek, Mackenzie, Cassiar Iskut-Stikine, and Lillooet LRMPs.

### Socio-Economic and Environmental Impact Assessments (SEAs)

The RFP calls for an academic review of the methods and procedures that are proposed for use in the preparation of SEAs for the LRMP process, and probably for other land use, environmental and resource allocation issues in B.C. The basic method proposed involves the use of MAA procedures, although bio-physical measures, cost-benefit analysis and other techniques are used within the various MAA accounts.

The MAA framework provides a flexible instrument for assessing the multi-dimensional consequences of alternative land use decisions. The usefulness of the MAA approach depends upon the selection of a set of individual accounts which

optimises the ability of the analyst to identify and, wherever possible, to quantify the main trade-offs involved among the various competing objectives that interested parties in land use decisions will bring to the table.

The MAA approach is more general than techniques such as cost-benefit analysis, because it allows for the inclusion of quantifiable outcomes that cannot easily be given monetary values, and for the qualitative analysis of those outcomes which are not quantifiable. In particular, the difficulties in obtaining explicit social valuations for environmental outcomes frequently provide the rationale for using MAA procedures. Nevertheless, a cost-benefit component can usefully be embedded within an overall MAA framework.

In all instances, a base case, or pre-decision, situation is documented, and possible post-decision outcomes under a variety of alternative land use configurations, or scenarios, are compared with the base case situation. This comparative methodology is applied within each of the underlying accounts. The analytical results are then synthesised across these accounts and key trade-offs are identified, making explicit the areas where informed judgements are required to resolve land use conflicts.

Commentary on the proposed structure (essentially what is taken as given, and what is not) of the base case used for comparative purposes within the MAA framework seems warranted. It is important to structure the base case in the most meaningful way for each Plan Area, while nevertheless providing for consistency in base case assumptions across Plan Areas. Some lack of consistency in base case assumptions was observed during the preparation of the provincial roll-up by *Pierce Lefebvre et. al.*, which made the roll-up more difficult to prepare. However, given the sequential manner in which the existing LRMPs were prepared, some inconsistencies in base case assumptions across the Plan Areas may have been unavoidable.

Commentary on the proposed structure of the MAA accounts is also required, including both the evaluation accounts pertaining to the Plan Area (where only the residents within the Plan Area have standing), and those pertaining to the Province as a whole (where all provincial residents have standing). It will be suggested that this dichotomy of evaluation accounts is both cumbersome and unnecessary, and that it would be preferable to follow a more basic structure that includes environmental, social, economic development, and net benefits accounts. The inter-relationships among the evaluation accounts, however structured, need to be analysed for consistency and completeness.

The methodologies used within each of the underlying accounts to measure the impacts (both outputs and outcomes) of alternative land use scenarios in comparison with the base case need to be reviewed and assessed. Measurement problems of both conceptual and data-limitation origin will constrain what is possible within the various accounts, especially those accounts which do not lend themselves easily to quantification. Nevertheless, within these constraints, the consistent use of best practice techniques is to be recommended.

Although a net benefits (or efficiency of resource use) account has been used

in other assessments dealing with environmental and resource related issues (the assessment of watershed restoration projects comes to mind), the formal inclusion of a net benefits account is an innovation, albeit a useful innovation, with respect to the use of SEAs within the LRMP process. There are, however, a number of methodological questions associated with this innovation. Many of these relate to the valuation issues which must be considered if social, economic development, and especially environmental account attributes are to be assessed in a manner that permits, wherever possible, their transference into the net benefits account.

### **Review Questions and Outline**

In addition to providing general commentary on the SEA methodology, including both its guidelines and processes, this methodological and procedural review will focus on providing answers to several questions. These questions are addressed in a variety of chapters, and include the following:

- (a) Is the MAA methodology appropriate for performing a socio-economic and environmental impact assessment in the context of the LRMP process?
- (b) If so, how could this basic methodology be improved and, if not, are there alternative methodologies which would be more appropriate?
- (c) Can the technical analysis recommended within specific accounts be improved?
- (d) Are the linkages and potential trade-offs between the individual accounts well specified?
- (e) Are the recommended methodologies capable of meeting a number of possible concerns, including:
  - (i) over-reliance on an economic base model of the development process,
  - (ii) insufficient quantification of the non-economic consequences of land use plans,
  - (iii) inadequate capture of environmental, community development and social values,
  - (iv) under-valuation of potential development in a number of economic sectors, and
  - (v) insufficient attention to the long-term economic health of the region or sub-region?, and
- (f) Are the recommended MAA procedures capable of delivering timely, succinct and reliable SEAs for use at the planning table and (in summary form) in community consultations?

The following chapters outline the key findings of this review. In particular, they discuss, in turn, the structure of the multiple accounts framework (Chapter Two), the comparison of land use outcomes (Chapter Three), environmental outcomes and the net benefits account (Chapter Four), and interactions among accounts and other concerns (Chapter Five).

## Chapter Two: Structure of the Multiple Accounts Framework

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### Impact Assessment Using Multiple Accounts

SEAs may be conducted using a variety of methods. However, given the breadth of regional and sub-regional zoning issues with which LRMPs must come to grips, and the inter-related nature of these issues, there can be little doubt that multiple accounts assessment (MAA) procedures provide an appropriate methodological framework for conducting the SEAs that are required within the LRMP process. Indeed, there are few other options.

The generic appropriateness of MAA procedures does not mean that any particular structure of accounts would be appropriate. Nor does it mean that different structures would be equally functional from an analytical perspective. Usually, there will be a preferred structure for the accounts.

The draft SEA guidelines propose a structure for the multiple accounts which is sub-optimal. The main reason for this is the initial separation of the accounts into Plan Area accounts and Provincial accounts. Among the Plan Area accounts are accounts which relate to (a) Plan Area economic development, (b) Plan Area environmental values, (c) community characteristics and quality of life, and (d) specific aboriginal community concerns. Among the Provincial accounts are accounts which relate to (a) Provincial economic development, (b) Provincial environmental values, (c) Provincial Government finances, and (d) economic efficiency of resource use.

There is substantial overlap and duplication across these two sets of accounts. From the perspective of functional analysis, the MAA framework suggested within the draft guidelines is, for this reason, both inefficient and cumbersome. Rather than making an initial separation between Plan Area accounts and Provincial accounts, it would be preferable to identify the relevant impact assessment fields for which accounts are required, and then, within each of these accounts, to distinguish Area-specific impacts from Provincial impacts only when it seems necessary to do so.

Generally speaking, for most SEAs there are only four major impact assessment fields, and these give rise to four basic accounts: the environmental account, the social account, the economic development account, and the net benefits (or efficiency of resource use) account. All socio-economic and environmental impacts can ordinarily be classified as falling within one or more of these four accounts. Within each account, however, impact assessments would be undertaken for a number of basic attributes. Wherever quantification is feasible, these attributes would ordinarily be represented by quantitative measurement indicators. Elsewhere, one would need to fall back on qualitative indicators.

## Distinguishing Local and Provincial Impacts: Who Has Standing?

There are essentially two reasons why the Area-specific and Provincial impact assessments that pertain to a particular attribute might need to be distinguished. The first of these relates to differences in *who has standing* in the impact assessment process. Is it only Area-specific residents or all Provincial residents? The second relates to inter-Area impact spillovers, which are partly a matter of geographical connectedness and partly a matter of economic connectedness. Mobility of economic activity between Plan Areas can also occur.

Nevertheless, for many attributes, separation of Area-specific impacts from Provincial impacts is both unnecessary and unhelpful. Impact assessment within the environmental account is ordinarily not separable into Area-specific and Provincial elements even if environmental impacts spill over from one Plan Area to another adjacent Plan Area. Environmental impacts need to be considered, regardless of their geographic spread. Thus, there is only one environmental account, which is essentially a Provincial account. Within this account, impact assessments may well be required for several environmental attributes. However, in the net benefits (or efficiency of resource use) account, the value that one might be able to place on a particular environmental impact may differ as the answer to the question, *who has standing?*, moves from Plan Area residents only to all Provincial residents.

For example, if a new park is created in a forested area largely, but not exclusively, for the protection of the habitat of certain wildlife species, the timber harvest values foregone may be valued equally from an Area-specific perspective as they would be from a Provincial perspective. The Province may also place equal value on any resulting impacts on community and employment stability as would the residents of the Plan Area. However, the value of the park itself may differ if the Area-specific perspective fails to recognise an *existence value* placed on the protected species by Provincial residents who live outside the Plan Area but do not use the park for recreational purposes, or if the Provincial perspective fails to recognise an *amenity value* placed on the park by Plan Area residents who do use the park for recreational purposes.

There are good reasons, however, why the proposed MAA guidelines include a net benefits (or efficiency of resource use) account only at the Provincial level. Essentially, the estimation of net benefits requires the analyst to take a broad Province-wide perspective on the *who has standing* question. Focusing the estimation upon only the net benefits which accrue to Plan Area residents pays scant attention to situations in which there may be significant net benefits (either positive or negative) for Provincial residents who live outside the Plan Area and/or significant impacts on the Provincial Government's net revenue receipts, either through resource revenue impacts or impacts on financial transfers into the Plan Area. A broad perspective is required within the net benefits account.

This conclusion also implies that financial outcomes at the Provincial Government level are really an integral component of the net benefits account. Indeed, the net benefits account is a bottom-line account within which the net social costs and benefits of quantifiable environmental and socio-economic outcomes are brought together and, as far as possible, given monetary values. Where

quantification is not feasible, one is ordinarily led to asking how large a value would need to be placed on qualitative outcomes in order for the sign of overall net benefits to be changed from positive to negative, or *vice versa*.

### **Where is the Local/Provincial Dichotomy Appropriate?**

That brings us to the socio-economic accounts. The key attributes that belong within the socio-economic accounts include indicators which relate to (a) local and provincial economic development, (b) community characteristics and quality of life, and (c) specific aboriginal community concerns, using the classification proposed within the MAA guidelines. However, it is recommended that attributes which relate to community and employment stability, and to lifestyle, recreational and First Nations concerns, be placed within a social account, and that a separate economic development account be created.

It is in the economic development account where local and provincial impacts may need to be distinguished. A particular land use decision may have important implications for economic development within the Plan Area. Although these direct implications may stimulate indirect and induced (or multiplier) effects on economic activity elsewhere in the Province, these effects may be of small consequence in the larger Provincial context. In fact, economic development attributes are generally local in scope and nature except where spill-over linkages generate significant multiplier effects on economic activity elsewhere in the Province, or where activity mobility gives rise to inter-Area substitution effects.

In summary, the main place where it may be important to distinguish Area-specific impacts from Provincial impacts is in the economic development account. Social account attributes will ordinarily tend to be local in nature, while environmental and net benefit (or efficiency of resource use) attributes are essentially Provincial in nature. In consequence, the initial separation of the accounts into Plan Area accounts and Provincial accounts is quite unnecessary, and makes the overall SEA process more cumbersome than it needs to be.

Attributes for which Area-specific impacts need to be distinguished from Provincial impacts can be identified, when the occasion arises, within the socio-economic accounts, and more particularly within the economic development account. Impact distinctions do not ordinarily belong in the environmental, social and net benefits accounts, although commentary may be required on the distribution of net benefits between Plan Area and other Provincial residents if any form of economic compensation and/or mitigation is being considered.



## Chapter Three: Comparison of Land Use Outcomes

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### Selection of Key Attributes

In the context of LRMP decisions, a considerable number of basic attributes need to be assessed, at the first instance, within the environmental, social and economic development accounts. This necessitates the use of multi-attribute decision analysis, which is a method for making the trade-offs between policy goals explicit. A good selection of key attributes will have the following characteristics:

- (a) completeness: the set of attributes covers all of the important aspects of the decision problem within the complete set of accounts;
- (b) operational ease: the set of attributes can be used meaningfully (for example, by taking a risk assessment approach to all environmental attributes);
- (c) decomposability: the set of attributes can be broken down into smaller independent sets, possibly contained within separate accounts or sub-accounts;
- (d) non-redundancy: taken together, attributes do not double-count impacts (which would be a danger with the structure of accounts proposed within the guidelines being reviewed); and
- (e) simplicity: the smallest possible set of attributes is used, while maintaining completeness.

For SEAs within the LRMP process, the starting attribute pertains to the classification, by hectares, of the total land area into protected areas, special resource management zones, general and enhanced management zones, and the like. This is required for both the base case, and for each potential land use scenario under consideration.

Key attributes or measurement indicators are also required, within the economic development account, for each of the major resource-based industries within the Plan Area, including forestry, tourism and recreation, energy and mines, and agriculture. For example, for forestry, these attributes are likely to include the timber harvesting land base (THLB), the sustainable long term harvest level (LTHL), and the allowable annual cut (AAC). The employment and income generating capability of each of these industries would also be involved in the socio-economic assessment process.

Attributes included within the environmental account might include risk assessment indicators for water quality, fisheries, wildlife, and bio-diversity, while attributes included in the social account tend to be somewhat amorphous. Again, a comparison of indicator values between the base case and each proposed land use scenario is required. This is also required for net benefits attributes and, in particular, net revenue outcomes for the Provincial Government.

## Base Case Definition: Basic Assumptions

Numerous statistics are available to characterise the base case for each LRMP area within the Province. In general, these statistics will include Plan Area population, its distribution between urban centres and rural communities, including First Nations communities, the contribution of each major industrial or extractive sector to employment and income generation within the Plan Area's economy, the existing footprint of industrial activities on the Plan Area's land base, the manner in which the land base is currently zoned in relationship to these activities, and statistics pertaining to existing resource stocks, including timber, grazing lands, habitats, wildlife, fish, water, and various metallic and non-metallic minerals, in relation to which there may well be considerable uncertainty.

Although the proportion of the land base that is initially given over to parks and protected areas (PAs) is generally known, the main rationale for the LRMP process is to bring greater certainty to land use zoning in relationship to economic activities in areas outside these existing PAs. This will typically involve the creation of new PAs, special resource management zones (SMZs), and other zones where there are less constraints on economic activities.

Each LRMP area within B.C. is influenced by a myriad of external factors, including commodity prices, softwood lumber disputes, regulatory policies, treaty negotiations, and the like. The impact of these external factors on the Plan Area will fluctuate over time. Nevertheless, it is important to define the base case, for the most part (but see below), as if these external factors were following predetermined trends or were unchanging, and to carry the same assumptions about external factors over to each alternative land use scenario which is to be compared to the base case. For example, if the Forest Practices Code is part of the *status quo* regulatory framework of the base case, for comparative purposes it should also be assumed to apply to each alternative LRMP scenario that is proposed for detailed study.

This does not imply that either the base case or the alternative land use scenarios are static snapshots. Each of them may involve a pattern of resource extraction and redevelopment that extends over several decades. Planned timber harvests, in particular, will tend to follow an inter-temporal course (or dynamic trajectory) which leads gradually over time from the existing AAC through to the LTHL. The whole path of planned harvests may be influenced by land use decisions which affect the overall size and characteristics of the THLB.

It is for this reason that a net present value (NPV) calculator will often be required for use within the individual MAA accounts, especially where economic development attributes and/or net social benefits are of concern. To use a central discount rate of eight percent real is appropriate for these NPV calculations, except where certain environmental outcomes are involved (see below).

Consistency across the SEAs undertaken for different LRMPs is more difficult to achieve, particularly if these SEAs are prepared at different times. Nevertheless, for analytical purposes, it would be useful wherever possible to standardise the assumptions that are to be made about external factors, and especially about the

overall framework of regulatory policies, when future SEAs are undertaken within the current LRMP process.

### **Comparison of LRMP Scenarios with Base Case**

Alternative land use scenarios should be well defined, distinct and few in number. The quantitative data that are required for the comparative analysis of each alternative land use scenario with the base case relate directly to the statistics that are used to describe the base case. However, it is essential to the SEAs process that comparisons between proposed LRMP scenarios and the base case be carried out on a common set of assumptions about external factor influences.

Since these comparisons are necessarily dynamic in nature, there is no reason to assume that the external factor influences always remain constant, or follow pre-determined trends, over time. For example, if it were known that the North American trading regime for softwood lumber would change for the better or worse at some point in the future, then this knowledge could be factored into the dynamics of both the base case and each alternative LRMP scenario. However, it cannot be factored into some scenarios and not into others if the comparative methodology is to remain valid.

It is, nevertheless, the case that regime shifting of this kind must be done sparingly, for otherwise the comparative analytical framework would become excessively complicated. Essentially, regime shifting should be limited to cases in which the shift is sufficiently important to influence the results obtained from the alternative land use scenarios to base case comparisons.

The extent to which the trend towards global warming is likely to continue, and at what pace, may well be important to the question whether or not to set aside larger protected areas to maintain wildlife habitat and the quality of water resources in a particular Plan Area. If this were the case, it could well be important to carry out comparative analysis that involves regime shifting, as a form of sensitivity analysis.

## **Chapter Four: Environmental Outcomes and the Net Benefits Account**

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### **Quantification and Monetary Valuation**

The recommended SEA methodology for use within the LRMP process involves a broadly-based MAA framework. However, a more narrowly-based cost-benefit approach can be productively embedded within this framework. Indeed, whenever it is feasible to place monetary values on quantifiable outcomes (that is, to monetise these outcomes), cost-benefit analysis should be applied. Cost-benefit analysis serves to aggregate those quantifiable outcomes that can be monetised, in a manner that makes it possible to compare overall benefits with overall costs, and thereby determine net social benefits. The central net present value (NPV) criterion of cost-benefit analysis also makes it possible to compare benefits and costs that accrue within different time periods.

Cost-benefit analysis has much to recommend it when costs and benefits are multi-faceted and time-dependent. Nevertheless, it must give way to cost-effectiveness analysis when outcomes can be quantified but not assigned monetary values. (Implicitly, a benefit-cost ratio may be interpreted as a value-weighted aggregate of a program's various cost-effectiveness measures, where each measure is a ratio of some quantifiable outcome to the program input costs that are incurred in achieving it.) However, both of these techniques must give way to multiple accounts analysis when only qualitative performance indicators are available.

The assessment of net benefits is inevitably difficult in situations where socio-economic and, especially, environmental outcomes are uncertain in addition to being multi-faceted and time-dependent. A multiple accounts and multi-attribute assessment framework is generally recommended in these circumstances. Such a framework permits quantitative performance indicators to be used wherever possible, but does not require that any formal attempt be made to monetise and, thereby, aggregate these indicators. The MAA framework also permits the use of qualitative, or ordinal, indicators for program attributes that are difficult, if not impossible, to quantify. For example, environmental risk assessment often utilises ordinal risk class indicators.

### **Bio-Physical and Bio-Economic Relationships**

The environmental account is one of the four key accounts of the MAA framework. Recent SEAs prepared within the LRMP process (for example, the Lillooet LRMP) have essentially taken an environmental risk assessment (ERA) approach to the environmental account. The health, or robustness, of each major natural resource stock is assessed using five risk assessment classes. Using key wildlife species as an example, very low environmental risk would imply that there is little or no danger that the species stock will suffer a serious decline as a result of the encroachment of human activity on wildlife habitat, whereas very high environmental risk implies that the species is vulnerable and may even be in danger of extirpation. The intermediate categories would ordinarily include low, moderate and high risk to the health (and potential survivability) of the resource stock.

The ERA methodology is applied to both the LRMP base case and to each alternative land use scenario that is under consideration, so that the complete grid of environmental risk indicators permits comparisons to be made between the base case and the alternative scenarios for each resource stock. These comparisons are qualitative in nature, since the ERA indicators do not easily translate into quantitative measures. Nevertheless, quantitative bio-physical relationships lie not far from the surface when ERA methodologies are applied.

Bio-physical relationships relate wildlife fecundity and abundance (or the productivity and biomass of fish species) to physical habitat characteristics, including habitat availability. If different land use designations lead to changes in the scope and nature of physical habitats, a bio-physical relationship should be able to predict what the potential impact will be on the relevant resource stock. Although considerable uncertainty is likely to surround predictions of this type, knowledge with respect to benchmark (or bio-standards) relationships between habitat changes and species vulnerability is expanding.

Quantification is important if the environmental account findings are to be carried over into the net benefits account in any formal way. However, by itself, quantification is insufficient because one must also place monetary values on quantitative outcomes if the potential resource stock effects of alternative land use plans are to be included in net benefit calculations.

The basic principle that should govern the quantification of biological outcomes is to count, as resource benefits/costs to be valued, all important stock (or biomass) additions/reductions which potentially may result from a change in land use designation. The basic principle that should govern the valuation of these stock additions/reductions is to use the best approximations one can obtain to resource rental values. Total stock additions/reductions should be multiplied by these resource rental values to obtain time-specific resource benefits/costs.

In addition, if stock additions/reductions accrue over time in response to a change in land use designation, the associated net present values should be calculated using a fairly low discount rate (perhaps as low as three percent real) for two possible reasons. The first is that increasing resource scarcity may give rise to an increasing trend in resource rental values over time, and the trend escalation factor may partially offset the force of discounting. The second is that investments in natural resource conservation may reduce the overall risk to the economic process, while disinvestments may increase it. It follows that a negative risk premium should be incorporated into discount rates where resource conservation benefits and/or disinvestment costs accrue over time.

Generally speaking, however, resource rental values are only readily available for marketable resources. For these resources, and except where market failure occurs (as, for example, in an open access fishery where resource rents are dissipated by an inefficient level of fishing effort), resource rental values may be estimated by subtracting unit harvesting costs from the market price of the resource, when harvested. In the case of timber resources, unit harvesting costs should not include Crown stumpage charges, which are a component (and, in most instances,

the largest component) of the economic rent that may be attributed to the timber resource.

Forest resources shelter much more than timber values. However, non-timber forest values are, for the most part, not directly observable in the market place. More generally, if valuation of the costs and benefits associated with land use impacts on non-marketable resources is required, it must be approached in other ways.

### **Harvest, Amenity, Ecosystem-Service and Existence Values**

All natural resources possess both use values and non-use values. Use values accrue when trees are harvested or a forest is enjoyed for its recreational values. Use values also accrue when fish are caught or angling provides recreational pleasure. We shall refer to the first of these two types of active use values, which result from the direct consumption of the resource, as *harvest values*, and the second (recreational) type as *amenity values*. Harvest values arise from the *flow* of the resource into consumption activities, whereas amenity values are derived from the *stock* of the resource that is used to support recreational or leisure-time activities. Both of these types of use values are to be distinguished from ecosystem-service and existence values.

*Ecosystem-service values* relate to the fact that the natural environment provides us with a variety of services, for example, as a source of clean water, a repository for waste disposal, a place where carbon sequestration occurs, a habitat for various wildlife species, and a source of herbs and other valuable biota. These passive use values are *flow*-related.

*Existence values* accrue from the knowledge that forests are available to provide timber resources, to provide recreational enjoyment, or to provide shelter for numerous plant and animal species, whether or not these resources are in use at present. Existence values would also accrue, for example, from the knowledge that particular salmon stocks are not about to be extinguished by over-fishing or habitat destruction. These non-use values are particularly important when endangered species (such as the Northern spotted owl or the marbled murrelet) or irreversible resource development projects are involved. However, similar to amenity values, existence values pertain to the resource *stock*, rather than to its *flow* into consumption through harvesting activities.

The resource benefits that potentially result from the creation of PAs and SMZs may include amenity values, ecosystem-service values and existence values, although harvest values may be foregone in the process. The costs that result from any resource exploitation which has the potential to degrade species habitats may erode each of these values. Resource trade-offs abound. Nevertheless, potential benefits and costs have both quantity and price dimensions. Quantitative impacts are specific to each land use plan, but prices may be generic, since they ordinarily transcend the individual plans. Estimates of these *shadow prices* may be available from secondary sources.

As previously indicated, unit values for resource stocks that are harvested

commercially can generally be obtained from actual transactions prices, which are directly observed in the market place, netted of unit harvesting costs, although these net resource rental values may require some adjustment in cases of market failure. The *willingness to pay* for recreational amenities (such as the value of an angler-day) can ordinarily be estimated by indirect (or surrogate) market methods, such as the *travel cost* method. Ecosystem-service benefits, such as water quality benefits, are often assessed by estimating the *avoided cost* of mitigative service alternatives, such as surface water filtration facilities. This avoided cost approach, which provides a lower bound to the willingness to pay for (say) water quality, is another indirect market method, as is the *hedonic pricing* approach, which sometimes uses variations in local property prices to estimate the value of environmental service quality, for example, of scenic views.

Thus, market observations can be used to estimate the unit values of all three types of resource use, although, in principle, amenity values and ecosystem-service values could also be obtained from the questionnaire survey techniques of the *contingent valuation* method. On the other hand, existence values can only be measured by using the contingent valuation method. Indeed, since existence values refer to the intrinsic value, as opposed to the use value, of resource stocks, they are inherently *public good* values for which no market prices exist.

The relationships between types of resource values and valuation methodologies may be summarised as follows:

- (a) harvest values are usually estimated from direct market transactions data pertaining to the resource in question,
- (b) amenity values and ecosystem-service values can normally be estimated from surrogate market transactions data that provide indirect evidence on willingness to pay, and
- (c) existence values can only be estimated from questionnaire surveys that attempt to estimate willingness to pay by using contingent valuation techniques.

Given the nature of these valuation methods, it is not surprising that the reliability of the estimated resource values generally falls as we move from harvest values, through amenity values and ecosystem-service values, to existence values. Particular care is always required to avoid double-counting across these various kinds of resource value.

Indeed, there are those who would challenge the validity of the *contingent valuation* method as an approach to the determination of existence values, and argue that the use values which are available from revealed (as opposed to stated) preferences are all that can sensibly be measured in monetary terms. Some would even go further to suggest that the search for a valid all-embracing, or comprehensive, estimate of the public's monetary value for protecting or restoring a given environmental resource is akin to a search for the *holy grail*. For these reasons, existence values (or the intrinsic non-use values of resource-related outcomes) may need to be handled, for the most part, in qualitative terms.

The conclusions that emerge from this analysis are as follows. First, for the purposes of the net social benefits account, only the differences in outcomes

between the base case and each alternative land use scenario need to be assessed. Second, for some environmental resources, these differences may not be quantitatively significant. In these cases, valuation is not required. (This may also be true for various social and economic development attributes.) Third, where significant differences are expected, an attempt should be made to place a socio-economic valuation on these impacts so that the net social benefits account can be made as comprehensive as possible. Fourth, where quantitative outcomes are too uncertain to measure, or where valuation is infeasible, qualitative indicators should be used, and the question should always be asked: how large would the NPV placed on these qualitative impacts have to be in order for the rankings by net social benefits of alternative land use plans (including the base case) to change? The rankings may be assumed to be robust if the required NPV is judged to be unreasonably large.



## Chapter Five: Interactions Among Accounts and Other Concerns

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### Linkages, Trade-Offs, and Completeness of Coverage

From the analysis contained in the preceding chapters it should be clear that the net social benefits account is a bottom-line account to which observed changes in attribute values from the other three accounts get transferred. There will also be some attributes, such as Provincial Government net revenue impacts, which are unique to the net benefits account. Environmental, social and economic development impacts that are registered, at the first instance, in one of these three accounts will ordinarily also show up in the net benefits account. Inter-account linkages of this type do not, of course, imply double counting of these impacts.

Potential trade-offs that are observed within the environmental, social and economic development accounts will also tend to show up in the costs and benefits that are transferred into the net benefits account. For example, if timber and/or mineral values are foregone because of the creation of a new protected area (PA), then the negative economic development impact will show up as a cost in the net benefits account while the positive environmental and/or recreational value of the new PA will show up as a benefit, assuming that the base case is the starting point for cost-benefit measurement.

Coverage is complete if all important attributes for which significant changes are indicated have been measured, either quantitatively or qualitatively, and assessed. If there are important attributes for which no assessment measures are available, this should be noted in the SEA report even if between-scenario changes are thought to be minor. This will serve notice that these attributes have not been overlooked in the MAA process.

### Miscellaneous Concerns

Concerns have been raised that the new SEA guidelines could lead to biased assessments. It has been suggested that biases could arise from three aspects of the SEA guidelines: over-reliance on an economic base model, inadequate capture of environmental and social values, and under-valuation of potential development and economic health. The last two of these potential biases appear to lead in opposite directions.

#### ***Over-reliance on an economic base model***

The economic development account separates primary Plan Area activities from secondary Plan Area activities. Primary, or base, activities are those which generate income for the region through market transactions with the rest of the Provincial and world economies. Exports of goods and services from the region, and net transfers of capital and social assistance payments into the region, are primary income-generating activities, while imports of goods and services into the region, and intra-regional transactions that result from the expenditure of primary, or base, income are secondary activities that depend upon base income.

The economic base model assumes that the Plan Area is a small open economy, within which indirect and induced activities are spill-overs from direct income flows that are externally-generated. These income flows are largely dependent upon the ability of the Plan Area to supply resource-based goods and recreational services to the rest of the Provincial and world economies, and upon the relative price at which these goods and services can be sold. The local multiplier effects that emanate from base income flows are relatively small because import leakages from the small regional economy are large.

Impact assessment within the economic development account should take into consideration these, albeit small, multiplier effects. In addition, the social account should assess the impact of changes in economic base activity levels on community and employment stability within the Plan Area. However, the net social benefits account should generally ignore multiplier effects, and restrict its focus to the efficiency of resource use. An additional reason for this is that, although Provincial multiplier effects will typically exceed Plan Area effects, base income changes (other than those which result from relative price changes that are common to many Plan Areas) frequently represent only the redistribution of base activity between Plan Areas, implying no net change in overall income for the Province as a whole.

It is the reviewer's opinion that biases are unlikely to result from the use of an economic base model, provided that this model is used correctly. The paradigm of the small, open regional economy is appropriate to the socio-economic impact assessment of alternative land use scenarios within the LRMP process.

#### ***Inadequate capture of environmental and social values***

The MAA framework is designed to capture all major socio-economic and environmental impacts that could emanate from alternative land use decisions. The framework includes environmental and social accounts as well as an economic development account. Accordingly, there seems to be no reason, in principle, why environmental and social values should be inadequately captured. Nevertheless, the inclusion of a net benefits account, which by its very nature tends to focus on those impacts which can be both quantified and monetised, could lead to an over-emphasis on economic outcomes, and particularly on items such as timber supply impacts which are transferred to the net benefits account from the economic development account.

One of the reasons why this review has placed considerable emphasis on the valuation of environmental outcomes, and on the associated difficulties involved in this valuation, has been to ensure, as far as possible, that environmental outcomes do get appropriate attention in the assessment of net benefits. Nevertheless, and especially where non-use or existence values are of issue, room must be left for qualitative judgements about environmental outcomes and, thus, about the land use trade-offs that are inevitably involved between development and preservation objectives.

This review has not paid a great deal of attention to the social account, and to social values. Nevertheless, since these values often play a vital bridging role between development and preservation interests at the local Plan Area level, they

should definitely not be ignored. Local participation in the LRMP process is the key to keeping these values in focus when SEAs are being prepared.

### ***Under-valuation of potential development and economic health***

Potential biases leading to the under-valuation of potential development and the long-term economic health of the Plan Area are the obverse of potential biases that could lead to the inadequate capture of environmental and social values in SEA reports. If a set of assessment guidelines is accused of both forms of bias, one can have some confidence that these guidelines are achieving a reasonable balance between development and preservation objectives.

The potential conflict between these two objectives is well illustrated in the two different scenarios which are compared with the base case in the Lillooet SEA report. Both the common ground, and the differences, between the two scenarios are well documented within that report. Qualitatively, at least, the costs and benefits associated with the land use trade-offs involved in the Lillooet LRMP process are appropriately identified, despite the fact that a net benefits account is not explicitly laid out within the SEA report.

### **Recommended Changes**

This review has recommended that a more efficient structure be imposed on the MAA framework, involving only four accounts, the environmental, social, economic development, and net benefits accounts. Where necessary, and mainly within the economic development account, differences between Plan Area and Provincial impacts can be identified at the appropriate juncture. The environmental account and the net benefits account are essentially Provincial in nature, while the social account is essentially local. The economic development account should be considered, at the first instance, as a local Plan Area account, with broader Provincial impacts being identified as appropriate.

This review has made methodological suggestions with respect to base case assumptions and the manner in which these assumptions should be carried over into alternative land use scenarios. It has also commented on attribute identification for the assessments that are to be carried out within each major account. The issues associated with environmental valuation have also been addressed.

It remains to assert that SEA guidelines which are based upon an MAA approach are appropriate within the LRMP process and, indeed, in other arenas in which land use, environmental and resource allocation issues arise. It is, nevertheless, important to get the structure of assessment accounts right. One should also assert that the draft SEA guidelines provide a useful initial template, one which should be refined rather than discarded. The refined MAA procedures should then be capable of delivering timely, succinct and reliable SEAs for use at the planning table and (in summary form) in community consultations.

Finally, there are a number of minor errors in the draft SEA guidelines which should be corrected. These include (on p. 9) a mis-specification of the relationship between market values, production costs, and economic rents. Production costs are

subtracted from market values to obtain economic rents, not from the rents themselves. They also include (on p. xv) a mis-specification of stumpage revenues where the Provincial Government's net revenue account is concerned. Actual rates at which stumpage charges are billed (or are expected to be billed) to Plan Area licensees should be used in the calculation of net revenue impacts, not the Coastal or Interior target rates. One must allow for the quality, location and species mix of the timber that is actually being harvested within the Plan Area, rather than assume that target rates of stumpage apply evenly across all Plan Areas within the Coastal or Interior region.

Actual stumpage rates may or may not fully capture available resource rents after the costs of both timber harvesting and compliance with forest management and replenishment obligations have been met by licensees (see p. xviii). A detailed assessment of this issue, which is also quite central to the softwood lumber dispute, can be found in the three companion reports, all prepared for the Ministry of Forests:

BriMar Consultants Ltd., *Forest Resource Rents and the B.C. Timber Pricing System*, April 1998; *The Valuation of Forest Tenures in British Columbia*, August 1999; and *Revenue Systems for the Forests Sector*, August 1999.

An additional reference which bears some relevance to the content of this review report is

BriMar Consultants Ltd., *Evaluation Template for the Watershed Restoration Program*, prepared for Forest Renewal BC, March 1999.