

**ECONOMIC ASSESSMENT  
PROCEDURE FOR FOREST  
MANAGEMENT OPTIONS  
IN THE  
PRINCE ALBERT MODEL  
FOREST REGION**

**S.N. KULSHRESHTHA  
DEPARTMENT OF AGRICULTURAL ECONOMICS  
UNIVERSITY OF SASKATCHEWAN**

**A Report Submitted to:  
THE PRINCE ALBERT MODEL FOREST ASSOCIATION**

**March, 1995**



The Prince Albert Model Forest Association is financially supported by the Canadian Forest Service through Canada's Model Forest Program.

Copyright © 1996 by:

Prince Albert Model Forest Association Inc.

P.O. Box 2406

Prince Albert, SK S6V 7G3

Telephone: (306) 922-1944

Fax: (306) 763-6456

All rights reserved. No part of this report may be reproduced in any form or by any means without prior written permission of the copyright holders.

Distribution of this report does not necessarily signify that the contents reflect the views and policies of the partner organizations of the Prince Albert Model Forest Association. Mention of trade names or commercial products does not constitute recommendation or endorsement for use.

**ECONOMIC ASSESSMENT OF FOREST MANAGEMENT  
OPTIONS IN THE PRINCE ALBERT MODEL  
FOREST REGION**

**S.N. Kulshreshtha**

**Professor of Agricultural Economics**

**Department of Agricultural Economics**

**University of Saskatchewan**

**51 Campus Drive**

**Saskatoon, SK., S7N 5A8**

**A Report**

**Prepared for The Prince Albert Model Forest Association**

**P.O. Box 2406, Prince Albert, SK., S7V 7G3**

## ***EXECUTIVE SUMMARY***

The manner in which a forest region is managed affects the society in several ways. Most obvious of these are the short-term direct changes that are borne by various members of the society. Less easily identified are long-term developments that affect the economic growth of the region as well as human welfare through changes in social and environmental institutions/resources. The decision maker(s) is (are) thus left with a difficult question of which options to choose, hopefully based on which ones are most desirable. Although selection of a management option is guided by the objective function, in order to provide clear directives for this process, an assessment framework is needed.

An assessment framework is needed to evaluate the relative merits of alternative forest management options for the Prince Albert Model Forest (PAMF) region. The scope of such a framework must be comprehensive since sustainable development is one of the major guiding principles of the entire Model Forest program, and, thus, inevitably, of the PAMF. Economic assessment is one of the three major aspects that are included under a comprehensive assessment; the other two are social and environmental. This study provides details on the recommended procedure for an economic assessment of forest management options.

The specification of the Economic Assessment Framework (EAF) is guided by various working objectives of the PAMF. A review of these objectives suggested that a variety of indicators are needed, including predictive, informative, program, and problem-oriented indicators. However, since the major use of the EAF is for providing evidence on the socio-economic effects of historical and recent forest resource use and conservation on people living within and in the vicinity of the model forest, selected indicators were predictive in nature.

The EAF suggests the use of multiple Accounts Analysis (MAA) in which three major economic criteria are included. These three criteria are economic efficiency, economic equity, and external effects or externalities. The recommended framework for MAA for the PAMF includes three major accounting stances - private, regional and provincial. Each of these accounting stances contains two or more accounts. Using the private accounting stance two accounts are recommended - economic efficiency in timber products, and economic efficiency in the production of commercial non-timber products

A regional perspective was interpreted in three alternative ways: One, it may reflect a combined objective function of the seven member groups; Two, it may reflect the objective function of the PAMF trading (economic) region; or Three, it may concentrate on the aboriginal people in the region. Depending upon which interpretation is accepted, five accounts are suggested. The PAMF Association account is estimated in terms of economic efficiency. The economic region account is designated in terms of three accounts - (i) Economic development of the region account, (ii) Non-aboriginal communities account, and (iii) Non-commercial values account. The aboriginal people's perspectives lead to development of a single account in which their economic development and communities are considered.

The third set of accounts is developed from a provincial perspective. Five accounts are recommended here – (i) Economic Efficiency Account, which measures the benefits to the provincial economy, including the region beyond the PAMF, (ii) Economic Development Account, which estimates the regional development of the province as a whole; (iii) a Non-commercial and Environmental Values Account, which estimates the impact of the option on activities which do not enter the market place, and/or which are not monetizable; (iv) Fiscal Impacts Account, which

estimates the impact of the option on provincial government revenues and expenditures; and (v) Sustainable Development Account, which estimates the impact of the option on the long-term development prospects for the province.

Development of some of the accounts requires input from both social and ecological impact evaluation. Together, the three assessment framework -- EAF, Social Impact Assessment Framework, and Environmental (ecosystem) Impact Assessment Framework -- chart the path to a comprehensive and integrated assessment of PAMF management options.



## ***ACKNOWLEDGEMENTS***

This study would not have been possible without financial assistance from the Prince Albert Model Forest Association, which is gratefully acknowledged. The author would also like to thank Dr. Thomas Bouman, Administrator, PAMF, for his timely advice and valuable suggestions. The author's thanks go to Joan Garvie for providing word processing services, Mike St. Louis for computer assistance, and Clair Lipscomb for technical editing. All of the help is gratefully acknowledged.



## ***TABLE OF CONTENTS***

<b>Chapter</b>	<b>Page</b>
EXECUTIVE SUMMARY .....	i
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS .....	vii
LIST OF TABLES.....	ix
LIST OF FIGURES .....	xi
Chapter 1 INTRODUCTION .....	1
1.1 Comprehensive Impact Assessment .....	1
1.2 Need for Economic Assessment .....	4
1.3 Objectives of the Study.....	5
1.4 Scope of the Study.....	6
1.5 Organization of the Study.....	6
Chapter 2 OVERVIEW OF THE EMPIRICAL ECONOMIC ASSESSMENT FRAMEWORK ...	8
2.1 Major Concepts for Economic Assessment .....	8
2.1.1 Economic Efficiency .....	8
2.1.2 Economic Equity .....	9
2.1.3 Externalities .....	11
2.2 Major Components of Economic Assessment Framework Requiring Further Specification .....	11
Chapter 3 SELECTION OF ECONOMIC INDICATORS .....	13
3.1 Concept of Economic Indicators .....	13
3.1.1 Definition of Indicators.....	13
3.1.2 Definition of Social/Economic Indicators .....	15
3.1.3 Type of Indicators Based on Their Use .....	16
3.2 Selection of Economic Indicators for the PAMF .....	17
3.2.1 Working Objectives of the PAMF and Economic Indicators.....	18
3.2.2 Categories of Economic Indicators.....	21
3.3 Suggested List of Economic Indicators for the PAMF for Economic Assessment.....	22
3.3.1 Measures Using Economic Efficiency Criterion .....	23
3.3.2 Measures Using Equity Criterion .....	23
3.3.3 Indicators Based on Externalities Criterion.....	24
Chapter 4 MULTIPLE ACCOUNTS ANALYSIS FOR ECONOMIC ASSESSMENT .....	26
4.1 Need for Comprehensive Method for Socio-Economic Assessment .....	26
4.2 Description of the Multiple Accounts Framework .....	27
4.3 A Multiple Accounts Framework for the PAMF.....	31
4.3.1 Accounts Under Private Accounting Stance.....	31
4.3.2 Accounts with Regional Accounting Stance .....	33
4.3.3 Accounts with Provincial Accounting Stance .....	36

## TABLE OF CONTENTS (continued)

Chapter	Page
Chapter 5 DEVELOPMENT OF EVALUATION ACCOUNTS .....	38
5.1 Development of Private Accounts .....	38
5.1.1 Economic Efficiency Sub-Account for Timber Products .....	38
5.1.2 Private Economic Efficiency Account for Commercial Non-Timber Products .....	41
5.2. Regional Accounts .....	44
5.2.1 PAMF Association -- Economic Efficiency Account .....	44
5.2.2 PAMF Regional Development Account .....	46
5.2.3 PAMF Regional Non-Aboriginal Community Account .....	49
5.2.4 PAMF Region Aboriginal Account .....	50
5.2.5 Non-Commercial Regional Values Account .....	52
5.3 Provincial Accounts .....	53
5.3.1 Provincial Economic Efficient Account .....	54
5.3.2 Provincial Economic Development Account .....	55
5.3.3 Provincial Non-Commercial and Environmental Values Account .....	57
5.3.4 Provincial Fiscal Impacts Account .....	58
5.3.5 Provincial Sustainable Development Account .....	59
Chapter 6 TOWARDS AN INTEGRATED ASSESSMENT .....	61
REFERENCES .....	65

## ***LIST OF TABLES***

<b>Table</b>	<b>Page</b>
Table 3.1: Working Objectives of PAMF and Need for Economic and Other Indicators.....	20
Table 3.2: A Tentative List of Indicators for PAMF Forest Use and Conservation Assessment.....	22
Table 4.1: Description of Accounts in the B.C. Multiple Accounts Framework for Assessing Forest Land Management Options .....	28
Table 4.2: A Multiple Accounts Framework for the PAMF .....	32
Table 4.3: Community Stability Indicators .....	35
Table 5.1. Plausible Accounting Stance of Various Members of the Prince Albert Model Forest Association.....	45



## ***LIST OF FIGURES***

<b>Figure</b>	<b>Page</b>
Figure 1.1: An Overview of Impacts of a Forest Management Option(s).....	2
Figure 5.1: Concept of Producer Surplus .....	40
Figure 5.2: Economic Value of Grazing.....	43
Figure 6.1: Schematic Presentation of the Integrated Assessment Model for the PAMF .....	62

## **Chapter 1**

### **INTRODUCTION**

Knowledge of potential impacts of adopting a specific forest management plan (option) is key to sound decision-making. The Prince Albert Model Forest (PAMF) Association, in order to fulfil its mandate, would undertake activities involving the evaluation of such impacts. In order to guard against future conflicts among various stakeholders, and to bring the decision-making process into an objective arena, a methodology needs to be developed that, once agreed upon, would lead to selection of the most efficient forest management option(s) for the PAMF Association

#### **1.1 Comprehensive Impact Assessment**

Desirability of a management option can be decided using one or more of several types of impacts that are relevant to the decision-making process. Figure 1.1 presents several types of impacts of alternative forest management activities. Under a given forest management option, the initial change occurs in terms of use (or a non-use) of the forest. This affects individuals and the ecosystem either directly or indirectly. Both of these affect human welfare to a certain extent either immediately or in the distant future.

Various impacts of a change in forest use can include three basic types:

- i) Physical changes/impacts;
- ii) Environmental impacts; and
- iii) Socio-economic impacts.

Physical changes refer to those that reflect physical variables and/or measurements. Included here are changes in timber, vegetation, groundcover, and other aspects of forests. These changes also include soil and water resources (both surface water and ground water). as well as wildlife (including

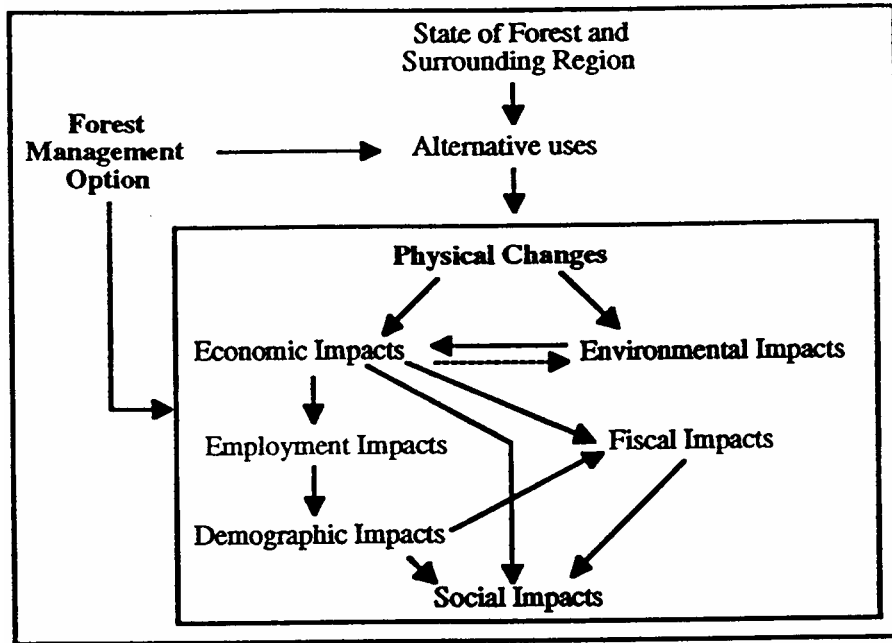


Figure 1.1: An Overview of Impacts of a Forest Management Option(s)

bird habitats). These physical changes affect the use of the resource, and result in two major types of impacts -- economic impacts and environmental impacts. These two impacts are not totally independent of each other.

Environmental impacts of a forest management option can be broad and complex. Many of these arise out of the physical changes created by anthropogenic activities. The environmental aspects and economic activities are also interrelated in two basic ways:

- i. environment plays an important "source" function for almost all economic activities. This includes soil, water, climate as factors of production, among others.
- ii. the wastes from the economic activities are released into the environment, which then provides the "sink" function for the by-products of economic activity.

The "sink" and "source" capacity of the environment are finite, and interrelated. This interrelationship between economic activities and environmental services was highlighted by The World Commission

on Environment and Development. (See Bruntland, 1987). Furthermore, as Christensen (1991) points out, "a biophysical perspective" is needed that emphasizes the materials, energy resources, technologies and information processes underlying economic activity (p. 76). The interrelationship gives rise to "economic valuation of environmental goods and services," which then becomes a subset of economic impacts of the forest management option.

The economic impacts are the second major type of changes that affect the welfare of our society. Economic impacts are realized through measurement and valuation of activity -- its size and distribution. Both of these aspects are important components of economic well-being -- a subset of overall human well-being.

The importance of economic impacts can be seen in terms of their implications for other impacts shown in Figure 1.1. Economic activity levels are directly translated into employment. This is based on the premise that increased economic activity cannot be carried out without the use of labour resources in some capacity. An increased level of economic activity thus inevitably gives rise to, at least in the short run, increased employment, which results in changes such as in-migration or out-migration, and commuting patterns of people, besides leading to adjustments in labour markets. Therefore, these changes lead to two more major impacts -- demographic and social.

Demographic impacts are a result of in-migration or out-migration of workers, which results in new growth in communities, or their demise, particularly those directly dependent upon forests. The increases or stability in population has implications for local governments -- their revenues and expenditures. These impacts are included under fiscal impacts.

Social impacts of a management plan are even more complex, partly because these have many dimensions. These impacts can be a result of economic changes (e.g., large economic activity

resulting in more stressful life style), or may occur through fiscal, demographic or environmental changes, leading to environmental degradation..

## **1.2 Need for Economic Assessment**

In the preceding section, it was noted that economic impacts constitute an important part of the total impacts. Let us now place economic assessment in a policy framework. According to Johnston (1988, p.3), the application of economics to resource policy analysis requires that analysis proceeds by identifying:

- i) Key characteristics of the resource;
- ii) Realistic resource constraints;
- iii) Relevant participants and institutions;
- iv) Behavioural responses of participants under different institutional arrangements and policy structures; and
- v) Current and future outcomes affected by policy options.

The economic assessment is a part of this policy analysis, since it is required for carrying out the last step in this process.

Estimation of current and future outcomes of a management option requires an empirical framework for economic changes, which is called an Economic Assessment Framework. Although a preliminary conceptual framework was prepared by Kulshreshtha, Moriarty, and Walker (1994), it did not provide a tool that can be readily adapted for the economic evaluation of the PAMF forest management options. The present study was designed to take the concepts in the above report, and extend them to an empirical stage.

The Kulshreshtha, Moriarty and Walker (1994) study recommended the following five elements for an economic assessment framework:

- i) selection of economic indicators for the assessment of alternative options;
- ii) development of an overall criterion or performance measure, which involves:
  - a) integration of economic indicators with non-economic ones, and
  - b) a framework, such as the multiple accounts framework, for presenting the results of evaluation;
- iii) tools for impact assessment for various indicators;
- iv) development of integrated models that could provide information to assess the nature of trade-off situations for a given option; and
- v) development of appropriate multiple criteria decision-making tool(s), enabling the decision makers to prioritize one option over the others (Kulshreshtha, Moriarty, and Walker, 1994, pp. 160-1).

Many of these elements need to be specified further. In particular, selection of economic indicators, a framework to display the results, and tools for impact assessment deserve further description/discussion.

### **1.3 Objectives of the Study**

The primary objective of this study to describe the following components of the recommended economic assessment framework for the PAMF region:

- i. Economic indicators of concern/interest to the PAMF Association;

- ii. Development of the Multiple Accounts Framework, and the associated tools/models for estimation of economic impacts; and
- iii. Method of integration between economic and environmental indicators, and thereby assessment of trade-offs between economic and non-economic (social and ecological) indicators.

Since acceptance of a policy option may create some externalities, endogenization of these is also an important aspect of policy analysis. A minor objective of this study is to develop a full-cost accounting principle for assessment, which should include of costs to various members of the society, as well as various constituents of the PAMF Association.

#### **1.4 Scope of the Study**

The methodology presented in this study is a recommendation for the PAMF Association and, thus, is contingent upon the goals and objectives of the Association. Any indiscriminate generalization of this procedure should be avoided. However, slight differences in objectives from those for the PAMF may not invalidate the methodology presented here.

#### **1.5 Organization of the Study**

The rest of the study is presented in five chapters. Chapter two provides a background to the scope of the remaining chapters. Included are the major concepts involved in economic assessment of alternative courses of action. This is followed by, in Chapter 3, a review of selection of indicators for economic assessment, and by development of the Multiple Accounts Framework, in Chapter 4.

The tools relevant for operationalizing the economic assessment framework are described in Chapter 5, which is followed by, in the last chapter, direction for future research in this area.

## **Chapter 2**

### **OVERVIEW OF THE EMPIRICAL ECONOMIC ASSESSMENT FRAMEWORK**

As noted in Chapter 1, the previous study recommended an economic assessment with five major components. Some of these components require further elaboration and empirical specification, prior to their use in assessing alternative actions. In this chapter these components are identified. This discussion is preceded by the identification of major concepts that are used in the economic assessment of alternative actions.

#### **2.1 Major Concepts for Economic Assessment**

In conventional economies, two concepts are often suggested for any policy evaluation: Economic efficiency, and Economic equity. To this list, with the growing awareness of environmental and social considerations, another concept can be added -- externality. Let us describe each of these.

##### **2.1.1 Economic Efficiency**

Economic efficiency measures how well various inputs are being used in the process of making output. This concept leads to gains to society under the premise that "gains to society will be greatest whenever there is minimum of waste" (Young, 1992, p. 27). Economic efficiency is defined in five alternative ways:

- i. Productive or Technical Efficiency: Production of a product increases until marginal costs of inputs equal marginal value of the product or benefits.

- ii. **Allocative Efficiency:** This type of efficiency is optimum if there is no alternative allocation of resources which would make at least one person better off and no one worse off
- iii. **Price or Private Economic Efficiency:** This is measured by examining how an individual or firm adjusts the ratio of various inputs to output as their relative price changes.
- iv. **Intertemporal Efficiency:** Application of Pareto Optimality through time (Johnston, 1988, p. 14). As factors affecting prices and society's valuations change, efficient outcomes will change. This measure estimates how well such adjustments take place.
- v. **Target Efficiency:** This is measured in terms of the success of the policy to impact the target group(s) selected. Target efficiency can be measured in two forms: Vertical Efficiency and Horizontal Efficiency. Vertical efficiency is related to the impacts of policy on target vs. non-target groups. The higher the impacts of the policy on target groups, the higher is the vertical target efficiency of the program. The horizontal target efficiency measures the distribution of impacts on various individuals in the target group.

Economic efficiency can be defined from an individual's perspective (private) or from a society's perspective (social). The difference between these two is the external effect, called externality of a certain choice.

### **2.1.2 Economic Equity**

Equity concerns are related to fairness, or economic justice. A just distribution of resources, rights, and wealth amongst people in a society is preferred. The same is also preferred over a period of time. Concerns for equity stem from the fact that economic efficiency assumes status quo

distribution. Distributional consequences of alternative forest management options are therefore of interest in decision-making.

Equity issues can be discussed over a period of time or for a given point in time. The former leads to the concept of intergenerational equity. This type of equity is emphasized under sustainable development. It involves determination of the weights to be placed on consumption at different points in time (Heal, 1986, p. 8). However, this type of equity is not easy to define. Young (1992, p. 41) suggested two types of conditions that meet this criterion:

- i. each generation should maintain the resource base it inherits and leave the next generation with a per capita stock that is no less than it inherited, and
- ii. the total stock of conditionally-renewable resources, resource diversity, and assimilative capacity should be maintained through time.

The second type of equity principle is that of cross-section equity or within-generational equity. In practice this concept suggests that there should be a continual bias towards introduction of management options that increase the welfare of poorer members of society that results in a significant redistribution of development opportunity to them. Issues related to this type of equity are often focussed on changing the access to resources by various groups.

Since equity is hard to define, economic policy assessments can only incorporate the distributional effects of the various choices into the analysis. Such distributive effects can be measured through effect on target groups, or through measurement of incidence on gainers and losers under a given management option.

### **2.1.3 Externalities**

Externalities are defined as the unaccounted for benefits or costs of a certain action. An external economy is said to be emitted when an activity is undertaken by an individual or firm, which yields benefits to other individuals or firms in addition to the benefits accruing to the emitting party (Boadway and Wildasin, 1984, p. 60). Externalities are not necessarily limited to economic changes. Some externalities, for example, may be produced through environmental changes which could, in the long run, affect economic production, and thus, sustainable development of the region.

The above three concepts are relevant for the development of the economic assessment framework for the PAMF region in two ways: One, the economic efficiency concepts are basic to all economic assessments, and therefore the framework must pay particular attention to it. Two, economic equity (connected directly to social justice) becomes a part of the social considerations, which together with the external effects (particularly the environmental type) lead to a need for integration of economic evaluation with social and environmental evaluation. The methodology for the EAF must keep these considerations in perspective.

## **2.2 Major Components of Economic Assessment Framework Requiring Further Specification**

Among the five major elements included in the conceptual economic assessment framework (as presented in Chapter 1), the following need further empirical specification:

- i. narrowing down of economic indicators to be used for assessment;
- ii. development of the multiple accounts framework for presentation of results of economic indicators;

- iii. identification of methodology (tools) to be used in the estimation of various indicators; and
- iv. potential avenues for integrating economic, social, and environmental indicators.

Selection of economic indicators requires some careful consideration of the stated objectives of the PAMF Association. A potential list of indicators needs to be drawn so as to make the economic assessment relevant to various partners of the PAMF Association. The specification of the multiple accounts framework (MAF) would follow the objectives as stated above, and the categories of indicators. This specification cannot be done independently of selected indicators. For each selected indicator, method of estimation including sources of data needs to be identified.

Avenues for integration are essential for achieving a comprehensive evaluation of options, yet this is also a very complex area, and is, therefore, left for future development. Some integration needs to take place at the level of indicators for assessment. As much as possible, in this study such integrated indicators will be specified, and their method of estimation developed. Other approaches, such as modelling of integrated processes, bio-physical modelling, ecological economic methods, have some potential, however, these are not explored in this study. These latter methods offer a wider scope for estimation of trade-offs between various indicators. In a situation where two plans of action lead to trade-off's among various indicators (and through them various objectives) methods such as multiple criteria decision making may be more appropriate.

This section has set the stage for the rest of this report. Conceptual framework for development of indicators is presented in Chapter 3, which is followed, in Chapter 4, by specification of the multiple accounts framework. Chapter 5 discusses the tools necessary for applying the Multiple Accounts Analysis to PAMF management options selection.

## **Chapter 3**

### **SELECTION OF ECONOMIC INDICATORS**

Indicators have a key role to play in management and policy development. Their role is tied to answering three basic questions related to the resource of interest to policy makers.

- i. What is happening to the state of the resource?
- ii. Why is it happening? and,
- iii. How can the state be improved?

Implicit in this is the measurement of the state of the resource and of the members of the target group. The purpose of this chapter is to describe the set of economic indicators that would assist the above process for the PAMF Association in evaluating alternative management options.

At the outset it should be noted that economic indicators are not the only criteria that are needed in this process. The other two major sets of indicators -- social and environmental -- are equally, if not more, important and would have to be developed in a similar amount of detail.

### **3.1 Concept of Economic Indicators**

#### **3.1.1 Definition of Indicators**

Before discussing the role played by indicators, let us describe what is meant by indicators. The Canadian Forest Service (Undated) has drawn a distinction among principle, criterion and indicator in the following way:

A **principle** is a fundamental guide to action. At one end of the spectrum, criteria support and clearly define concepts that flow from the principles; at the other, monitoring and measurement of indicators and comparison with reference levels permit the tracking of progress toward sustainability.

A **criterion** is defined as a distinguishing characteristic that provides a policy framework. With the principles adopted at UNCED and in the National Forest Strategy as guides, the framework will include criteria that are central to any decisions made with respect to sustainable forest management.

An **indicator** is a measurable variable. For each criterion, there will be one or more indicators that can be used to report the status or trend of that criterion. Each indicator will be monitored regularly, and the measurements taken will be compared with established baselines and historical data to show trends.

Following the above conceptual framework, it is clear that an indicator must be measurable, and be consistent with the set of criteria selected. Thus, indicators are statistics that measure or reflect the status or change in the condition identified by a criterion.

Indicators can also be described to be surrogates; they are surrogates since they relate back to the unmeasurable concept of which it is a proxy (Carby, 1982). For example, many measures in economics are related to the notion of human welfare narrowed down to economic welfare. Since a direct measure of such welfare is not possible (at this point in time), indicators are selected to

describe some aspect of it. An indicator such as per capita disposable income is a surrogate measure of the economic welfare of an individual.

### **3.1.2 Definition of Social/Economic Indicators**

Social and economic indicators are related in the sense that they both look at the non-physical (non-ecological) aspects of changes affecting society. In this manner these two types of indicators could be considered very similar. Using Land's (1975, p. 14) definition, we can define a social (economic) indicator as follows (square parentheses added):

Social [economic] indicators are statistics which measure social [economic] conditions and changes therein overtime for various segments of a population. By social [economic] conditions, we mean both the external (social and physical [and economic]) and the internal (subjective and perceptual) contexts of human existence in a given society.

According to this definition any index of social (and economic) activity can be classified as a social (economic) indicator provided that it can be construed as surrogate of a social (economic) condition of some population.

Although researchers in the field of indicator development are not in full agreement with a single definition, there appears to be some consensus in terms of the following components of a definition of an indicator. Social (economic) indicators must:

- i. be measures of social (economic) conditions;
- ii. be measured over a period of time;
- iii. be disaggregatable;

- iv. display a historical pattern of covariation with social (economic) change;
- v. be of normative interest, and must be related to social (economic) welfare,
- vi. be direct measures of variables they represent, and
- vii. be defined so that change in one direction is always considered to be good.

There is less agreement on the last two components than is the case with the first three (Rossi and Gilmartin, 1980, p. 18). One major characteristic of a good indicator is that it must be normative in nature and relative to socio-economic changes.

### **3.1.3 Type of Indicators Based on Their Use**

In spite of definitional controversies, various types of indicators can be distinguished. One important distinction among various indicators can be made based on a single value measure vs an index. In the latter type, a number of single indicators are combined to yield an index. Indicators can be subjective -- based on people's feelings, attitudes and evaluation -- or objective in nature -- based on people's conduct and behaviour. One of the most discriminating ways to classify indicators is by the nature of their use. Carlisle (1972) has suggested four such classes of social indicators, which can also be used to classify economic indicators:

- i. Informative indicators;
- ii. Predictive Indicators;
- iii. Problem-Oriented Indicators; and
- iv. Program Evaluation Indicators.

Informative indicators are intended to describe the state of the society (economy) and changes taking place within it. Such indicators are not intended to explain changes or to prescribe solutions to any

problems. In most cases such indicators are direct measures of a certain activity's inputs or outputs. For example, estimates of potential wood supply or net present value of the timber in a region will be an informative indicator.

Predictive indicators are those that are used to identify relationship between informative indicators. However, this requires a context of causal relationship based on some prescribed theory. Such indicators are particularly useful for evaluating trade-offs between alternative forest uses.

Problem-oriented indicators reflect present state for key problem areas identified by policy evaluators. However, a problem area is isolated, the nature of problems associated with the area identified, and indicators are selected so that they represent a comprehensive coverage of the problem and associated issues. Socio-economic conditions of aboriginal people and indicators selected to describe them may be classified under this category.

Program-evaluation indicators refer to performance of an economic system. For policy makers it is important to show how a selected program is performing in terms of its aim (stated objective), and how efficiently it is using resources committed to it. Without such measures there is no satisfactory basis for analysing of current programs, or for appraising new programs, or even for comparing various alternatives. Many of the indicators for economic assessment would fall under this category.

### **3.2 Selection of Economic Indicators for the PAMF**

For the discussion in Section 3.1, important factors that should be taken into account for selecting economic indicators are i) objectives of the PAMF and that of economic assessment, and ii) anticipated use of the indicators. Each of these requires further elaboration. However two other

criteria that should be used in selecting indicators, according to Bakkes *et al.* (1994), are analytical soundness and measurability. These four characteristics of indicators should be used in finalizing the indicators for the PAMF.

According to OECD (1993), the analytical soundness criteria for an economic indicator should be:

- i. theoretically well-founded in economic terms;
- ii. based on national and international consensus about its validity; and
- iii. easily linked to other indicators, particularly those with origins in the social or environmental effects.

Similarly, the measurability criterion would suggest that an indicator should be

- i. readily available or made available;
- ii. updated frequently using reliable methodology; and
- iii. adequately documented in terms of quality.

These criteria serve as a background to the first two factors in the selection of indicators. Of paramount importance in the selection of indicators are the objectives of economic assessment.

### **3.2.1 Working Objectives of the PAMF and Economic Indicators**

The objectives of economic assessment must be consistent with those of the PAMF. Therefore, a review of the PAMF working objectives is required. The six working objectives of the PAMF relevant to socio-economic analysis can be stated as follows (based on Kulshreshtha and Walker, 1994):

- i. Provide evidence on the socio-economic effects of historical and recent forest resource use and conservation on people living within and in the vicinity of the model forest;
- ii. Develop a socio-economic methodology to assess management options in multicultural communities with significant indigenous population;
- iii. Identify economic opportunities and induce industry investment to increase socio-economic well-being of local communities;
- iv. Predict and evaluate long-term socio-economic trade-offs of integrated management plans;
- v. Enhance First Nations' participation in forest resource development and conservation; and
- vi. Clarify the social and economic role and significance of mixed white spruce ecosystem. Table 3.1 shows the need for indicators for each of the objectives shown above. Many of these objectives require a comprehensive assessment. A comprehensive assessment requires inclusion of economic, social, as well as environmental indicators.

At the outset one would note that all these objectives require indicators. Objectives ii), iv) and vi) require the comprehensive assessment approach and an integration among economic social and environmental indicators. The other three are more economics oriented or with a combined socio-economic focus. Each of these objectives also require different types of indicators. For example, role of white spruce ecosystem is primarily an information need type of objective, and, therefore, requires informative types of economic indicators. The same can be applied to objectives of economic opportunity identification.

**Table 3.1:**  
**Working Objectives of PAMF and Need for Economic and Other Indicators**

Objective	Need for Indicators			Type of Indicator
	Econ.	Social	Envir.	
i) Socio-Econ. effects of forest use and conservation	X	X	X	Predictive
ii) Socio-Econ. Methodology	X	X	X	Predictive
iii) Econ. Opportunities	X	--	--	Informative
iv) Trade-offs evaluation	X	X	X	Program
v) First Nations Participation	--	X	--	Problem oriented
vi) Social and Economic Role of White Spruce Ecosystem	X	X	X	Informative

The socio-economic effect estimation (objective [i]) and development of socio-economic methodology (objective [ii]) require predictive type indicators. These indicators should be able to estimate the change in the economic (social and environmental) health of the concerned society as a result of forest use changes including conservation. In some ways, development of the methodology for socio-economic impact estimation is an intermediate step. Thus, the list of economic indicators for these two steps would be identical.

The estimation of trade-offs requires the use of program evaluation type indicators. Since a trade-off situation may exist between economic and social, or between economic and environmental health of the region, such indicators need to cover all these three types of impacts of changing forest management.

The objective related to First Nations' participation also requires development of some indicators. However, many of these relate to the social field of research, and are therefore beyond the scope of this report.

### **3.2.2 Categories of Economic Indicators**

Beside the nature of indicators based on objective and expected use, economic indicators are grouped into three categories: Direct, Indirect, and Induced (Leat and Chalmes 1991). The direct indicators are measures of economic activity associated with a particular action. These may include among others sales, income, employment, number of firms, and average size of unit. The indirect indicators measure the knock-on effect of direct changes on other industries that are related to it indirectly. For example, direct effects of one management strategy might be an increase in pulp and paper production. The indirect measures would then be related to the economic activity of industries providing inputs and infrastructure, such as chemicals and logging. The induced indicators measure changes that are brought about through increased incomes resulting in higher household consumption of goods and services. These measures may include expenditures, per capita incomes, as well as other economic aspects of economic activity of families (households) and communities.

In addition to the three types of economic indicators, two other types of indicators may also be identified. These are induced social indicators, and induced environmental indicators. These indicators integrate the three types of assessment, and therefore are relevant from a sustainable development context. Induced social indicators will include the measures of change in social indicators as affected by level of economic activity. Similarly, induced-environmental indicators will measure changes in environmental quality associated with economic growth

### 3.3 Suggested List of Economic Indicators for the PAMF for Economic Assessment

Since the intended use of the economic assessment framework is for meeting objective number i) in Table 3.1, the type of discussion in this section is limited to predictive types of indicators. In order to develop the list of indicators, criteria for assessing economic policies are considered. Thus, indicators are developed under each of these criteria headings.

Let us recall that three major criteria of economic policy assessment are economic efficiency, economic equity and distribution, and externalities. Let us also identify the three types of economic indicators -- direct, indirect, and induced for each of these criteria for economic policy assessment. A list of relevant indicators is shown in Table 3.2.

**Table 3.2:  
 A Tentative List of Indicators for PAMF Forest Use and Conservation Assessment**

Criteria	Type of Indicator		
	Direct	Indirect	Induced
Economic efficiency	Net Benefits	<----Total Net Income Generated ---->	
	B-C Ratio		
	Direct Net Income		
	Generated Export		
	Sales competitiveness		
Economic-Equity & Regional Growth	Direct Regional GDP	<---- Total Regional GDP generated ---->	
	Direct Regional	< --- Total Regional Employment ----->	
	Employment Well-being of Target group	<----- Community Stability Index ----->	
		< ----- Impact on Traditional use of Forest ----->	
	Distribution of Employment by Groups		Fiscal Efficacy
		Service Quality Impacts	
Externality	Resource Use Impacts	<--- Extended Social Benefit Cost Ratio ---->	
	Environmentally Adjusted		
	Economic Measures		Quality of Life Index

### **3.3.1 Measures Using Economic Efficiency Criterion**

Under economic efficiency criterion, many indicators are of direct type. These include i) Gain in economic efficiency as measured by economic benefits resulting from a given forest use; ii) Ratio of benefits to disbenefits or costs under a given forest use when these are extended over the life of the project, measured as benefit cost ratio; iii) Generation of net household income (net benefits to people); iv) Changes in export sales -- a measure of foreign exchange earnings under the option; and v) Competitiveness of various industries under the given forest use. In addition to these, indirect and induced indicators can be added in terms of net income generated in the rest of the economy.

### **3.3.2 Measures Using Equity Criterion**

Following economic equity criteria, two aspects are important - regional growth and distribution of benefits. Regional growth can be estimated through the following direct measures:

- i) Direct contribution of the forest use to gross domestic product of the region;
- ii) Direct contributions of the forest use to regional employment. Similarly, distribution of impacts of a given forest use can be measured with the help of the following direct indicators:
- iii) Well-being of target group (in the case of the PAMF, the aboriginal communities and people therein would form the appropriate target group); and
- iv) Distribution of employment by some pre-selected groups in the region.

Indirect and induced indicators based on economic equity criterion may include four indicators:

- i) Total Regional Gross Domestic Product based on indirect and/or induced impacts;

- ii) Total Regional Employment, based on indirect and induced impacts;
- iii) Community Stability Index; and
- iv) Impact on Traditional use of forests by aboriginal groups of people.

Two other indicators can be identified besides the above list of indicators. These include i) Fiscal Efficacy of a program which measures the changes in revenues and costs to the local government (administrative body) under a given forest use; and ii) Service quality impacts to local people to include change in quality of various services at the community level. The latter types of indicators are also relevant to social impact assessment.

### **3.3.3 Indicators Based on Externalities Criterion**

Externalities related to economic actions relate to two major aspects -- social change and impact on the environment. Indicators for both of these changes need to be developed fully under social and environmental assessment of forest use and conservation. Environmental assessment of economic policy is based on the premise of interrelationship between economic activity and environmental degradation as well as depletion of natural capital. Both of these aspects of this interrelationship can be captured by the following indicators: i) Resource use impacts, which is the depreciated value of the natural resource of concern. In the context of PAMF this would be measured in terms of value of standing timber; ii) Environmentally adjusted net regional product. This measure will take into account any environmental degradation resulting from a specific forest use/conservation measure. More details on these measures will be provided along with approaches to integration in Chapter 5 of this report.

The changes in the environmental goods and services can be included in the benefit-cost ratio used for measuring economic efficiency. The ratio now becomes an "extended social benefit-cost

ratio" since the inclusion of effects is extended from merely economic to broader economic and environmental concerns.

The economic changes also result in certain social changes, particularly those related to quality of life type. These changes can be included in the assessment of a given forest use through changes in quality of life index.

Once a list of indicators is finalized, the next steps include i) developing a method of presentation/displaying various indicators; and ii) measurement and estimation procedures for various indicators. The first one is discussed in Chapter 4, whereas the second step is described in Chapter 5.

## **Chapter 4**

### **MULTIPLE ACCOUNTS ANALYSIS FOR ECONOMIC ASSESSMENT**

Economic assessment of forest management options can be carried out using a variety of methods: i) Benefit-cost analysis which measures gain to society in terms of economic efficiency; and ii) Economic impacts analysis which estimates impact of the option on income and employment. Both of these techniques are suitable if the purpose of analysis is a single dimensional -- economic efficiency, or equity. However, given that for the PAMF all three criteria of economic policy assessment are important, either of these methods singly is entirely satisfactory. The framework that would be suitable under such a situation would have to include multiple aspects of impacts of alternative forest management.

#### **4.1 Need for Comprehensive Method for Socio-Economic Assessment**

Analysis of a program using a set of objectives is not a new concept. This type of analysis was first developed for water resource assessment by the U. S. Water Resources Council (1983). The analysis included four major objectives:

- i) Economic Efficiency;
- ii) Economic Equity;
- iii) Regional Development; and
- iv) Quality of Life.

The technique is more commonly known as multiple accounts analysis (MAA). The MAA has been used in Canada, first by the Department of Fisheries and Oceans in evaluation of salmoid projects

(as referenced by Province of British Columbia, 1992), and more recently in the evaluation of forest land use options by Marvin Shaffer and Associates ( 1991 ).

## **4.2 Description of the Multiple Accounts Framework**

A multiple accounts analysis is a name given to different categories of information on relevant decision variables. Each account contains a specific type of information. The method recognizes the various dimensions in economic and social assessment of alternative management options. In fact, by not having concentrating on only one or two variables, the technique provides more flexibility in displaying the results of the evaluation.

The results of MAA may not lead to choice of one single option. However, the major advantage of the technique lies in its ability to display both positive and negative changes resulting from adopting a specific management option. Thus, both advantages as well as disadvantages of each option are displayed for consideration by decision maker.

The MAA technique can be broken down into four steps:

- i) development of a multiple accounts framework, including identification of various accounts to be included in the framework;
- ii) defining various types of effects to be included under each account;
- iii) estimation of values of various accounts; and
- iv) communicating through displaying the advantages and disadvantages of various management options.

Depending upon the nature of accounts selected for a particular situation, the second step is identical to identification of economic indicators, as presented in Chapter 3 of this report.

The selection of various accounts is subject to discretion of the decision-maker(s), and is dependent upon the range of effects and the perspectives that are considered important. For the province of British Columbia, as shown in Table 4.1, two types of accounting perspectives have been suggested i) regional accounting perspective; and ii) provincial accounting perspective. The regional assessment takes the point of view of the people and institutions (such as communities) within the area of interest. In contrast, the provincial accounting perspective is that of the provincial society. Each of these perspectives has four accounts. These accounts are described below, based on the B.C. guidelines.

**Table 4.1:  
 Description of Accounts in the B.C. Multiple Accounts Framework  
 for Assessing Forest Land Management Options**

<b>Account Perspective</b>	<b>Nature of Account</b>
Regional	1) Economic Development
	2) Environmental Values
	3) Community Characteristics
	4) Specific Native Community Concerns
Provincial	5) Economic Development
	6) Environmental Values
	7) Provincial Government Finances
	8) Economic Efficiency of Resource Use

Source: Province of British Columbia (1992)

1. Regional Economic Development Account: This account documents the effects of an option in terms of production (output) of goods and services, income, and employment in the local economy. These effects include direct, indirect, and induced impacts of a management option.
2. Regional Environmental Values Account: This account documents how each management option affects the benefits derived from, or values attached to, non-commercial resources and attributes in the area. These include use-related values as well as existence-related values, such as those pertaining to biodiversity, wildlife, intact ecosystem, and natural features.
3. Regional Community Characteristic Account: This account shows how each management option would affect the nature and quality of life of communities in the region of interest to the decisionmaker. These impacts include population, fiscal revenues and expenditures, provision of services, community goals, such as stability and economic diversity, among others.
4. Regional Specific Native Community Concerns Account: This account documents relevant impacts on the native (aboriginal) people and their communities in the region. This includes assessment of impacts on native community resources, cultural values, and traditional use of the forest. In addition, many of the regional economic impacts in account (1) above may also be applicable.
5. Provincial Economic Development Account: This account documents the economic impact of the management option on communities outside the project region, and on the province as a whole. These impacts may include output, income, and employment, both in terms of direct and total (direct, indirect, and induced) impacts.

6. Provincial Environmental Values Account: This account documents how each management option affects the non-commercial environmental values outside the project region, and the existence and preservation related values of the forests.
  
7. Provincial Government Finances Account: This account documents how each management option affects provincial government revenues and expenditures. The revenues include both direct revenues (resource related tax or royalties), and indirect revenues (income and sales taxes, among others). Similarly, all direct and indirect expenditures are included.
  
8. Provincial Economic Efficiency of Resource Use Account: This account documents the net economic benefits that are generated in the province by each management option. These net economic benefits are calculated using the principles of benefit-cost analysis.

The above description of multiple accounts, as recommended for the B.C. forest land management, is relevant to the present task of developing an economic assessment framework for the PAMF. At the same time, this task cannot be totally divorced from the discussion of economic indicators relevant for the PAMF. This synthesis of indicators and multiple accounts framework is presented in the next section.

### **4.3 A Multiple Accounts Framework for the PAMF**

For the PAMF we can visualize at least three major accounting stances: Private -- accounting stance of individual member organization of the PAMF Association; Regional -- to include the PAMF Association as a whole, the trading region including communities, and the aboriginal communities; and Province, which is to include rest-of-Saskatchewan region and province as a whole.

Under each accounting stance several accounts and sub-accounts can be identified. These are shown in Table 4.2. The framework contains 12 accounts -- 2 for private accounting stance, and 5 each for regional and provincial accounting stances. Indicators that are associated with each of these are also listed in Table 4.2.

#### **4.3.1 Accounts Under Private Accounting Stance**

Private accounting refers to inclusion of those changes that accrue to the decision-makers directly; any changes accruing to other individuals, either directly or indirectly, are considered external to this accounting stance. Two accounts are relevant under this accounting stance: i) Economic Efficiency account for timber and its products, and ii) Economic Efficiency account for commercial non-timber products.

The first account will document gains to the timber producers (in this instance, Weyerhaeuser Company) from a given management option. These gains can be measured through three indicators:

- i) Net Private Benefit - Value of output, and income accruing to Weyerhaeuser Canada;
- ii) Private Benefit Cost Ratio - Benefits as measured above relative to costs incurred by Weyerhaeuser Canada;

**Table 4.2:  
 A Multiple Accounts Framework for the PAMF**

<b>Accounting Stance</b>	<b>Accounts - Sub-Account</b>	<b>Indicators</b>
Private	(1) Economic Efficiency -Timber	- Net Private Benefits - Private Benefit Cost Ratio - Change in Market Share - Export Sales
	(2) Economic Efficiency - Commercial Non-Timber Products	- Net Private Benefits - Private Benefit Cost Ratio
Regional	(3) PAMF Association - Econ. Efficiency	- Net PAMF Benefits
	(4) PAMF Region - Econ.Development	- Output, Income Employment
	(5) PAMF Region - Non-Aboriginal Communities	- Community Stability - Quality of Life
	(6) PAMF Region - Aboriginal Account	- Output, Income and Employment - Distribution of benefits - Effect on traditional Forest Use - Community stability - Quality of life
	(7) PAMF Region - Non-Commercial Values	- Non-market goods - Resource Depletion - Environmental Values
Provincial	(8) Economic Efficiency	- Net Provincial Benefits - Extended B-C Ratio
	(9) Economic Development	- Direct and Total Output, Income and Employment - Income Distribution
	(10) Non-Commercial and Environmental Values	- Non-Market Goods - Resource Use Impacts - Environmental Changes
	(11) Fiscal Impacts	- Government Revenues - Government Expenditures
	(12) Sustainable Development	- Index of Sustainable Economic Welfare - Total Net Value Added

- iii) Effect on the competitive position of the firm for various products produced -- lumber, pulp, and paper products as measured through:
  - a) Change in (or effect on) market share of the firm.
  - b) Change in export sales of the firm.

Thus, this account will display estimated changes under a given management operation on the private economic efficiency (net private benefits level) for the forest management firm. The estimation would be limited to timber-related enterprises. Thus, in addition to the woodlands operations, operations of the Big River Sawmill and P.A Pulp and Paper Mill will be included under this account.

The second account: Economic Efficiency for commercial non-timber products would essentially be the same as above, except the products included would be non-timber products such as outfitting, trapping, specialty forest products, commercial fishing, wild rice production, grazing, and other commercial uses. The indicators to be used in estimating the value for account would be identical to that shown above for account (1), except that effect of the competitive position of the firm may not be that relevant.

#### **4.3.2 Accounts with Regional Accounting Stance**

A regional accounting stance refers to estimation procedure where changes occurring within a specified "region" are counted, but any changes beyond the region are called externalities. In the case of the PAMF, a regional accounting stance may be viewed in two alternative ways: One, composite values of changes for all members of the PAMF Association; and Two, a geographical region of interest to the PAMF Association. The first accounting stance is easy to estimate, since it is a sum of individual (private) accounting stances with all double-counting eliminated. The second

concept of a region in terms of a geographical region is more difficult, since this concept would vary from purpose to purpose. For example, for wildlife management, a wildlife management zone might be appropriate; for water resources, a river basin or water catchment basin may be used, for ecological processes, an ecological zone might be preferred. However, given that the objective of the intended assessment is socio-economic development, two geographical boundaries are proposed: i) geographical boundary of the PAMF; and ii) economic trading region of the communities and people within the PAMF. Each of these boundaries is used in appropriate regional accounts.

Five regional accounts are set up under this framework. The first one is that of economic efficiency account for the PAMF Association (Account 4). This account will document the combined (aggregate) gain in economic efficiency for all seven partners of the PAMF Association, The indicator that would be used to estimate the value of this account is the aggregate net benefits.

The second account (Account 5) under this accounting perspective is the PAMF Region's Economic Development Account. The definition of the region would be that of the trade-area, which is an area within a 48-mile radius of the PAMF, and includes the city of Prince Albert. A boundary for this region was developed by Kulshreshtha, Siemens, Doell, and Walker (1994, p. 180). The economic development account will include direct, indirect and induced economic impacts of a management option measured in terms of output (production of goods and services), incomes, and employment.

The third account (Account 6) is that of Non-Aboriginal Communities with the PAMF. This includes the community of Lake Waskesiu. The account will document the effect of alternative management options on the community stability and on quality of life at that community. The latter is a social indicator, and, therefore, left for social assessment framework. The community stability

is also a multidimensional subject. Indicators for measuring this account can be economic, social and environmental. A list of such indicators, based on Simons Strategic Services Division and Cortex Consultants Inc. (1991) is shown in Table 4.3. These indicators include major economic impacts related to forest sectors in terms of employment, sales revenue, employment income, and to community revenues. Other economic/social indicators such as population, residential building permits, motor vehicle licenses, school enrolment, and business starts/failure are also included as measure of community stability.

The PAMF Region - Aboriginal Account (Account 6) documents concerns retirement to aboriginal people and their communities. Specifically this would include the Montreal Lake Cree Nation community, along with residents of Weyakwin, Little Red Reserve and Timber Bay. The indicators that could be used for these concerns include.

**Table 4.3:  
 Community Stability Indicators**

1	Forest Sector Employment (persons)
2	Forest Sector Sales Revenues (\$ 000)
3	Forest Sector Employment Income (\$ 000)
4	Forest Ind. Employment to Comm. Employment (%)
5	Forest Sector Revenues to Community Revenues (%)
6	Forest Sector Payroll to Community Payroll (%)
7	Community Employment (persons)
8	Community Payroll (\$ 000)
9	Community Labour Force (persons)
10	Community Employment to Labour Force (%)
11	Community Population (persons)
12	Community Residential Building Permits Issued (\$ 000)
13	Community Total Building Permits (\$ 000)
14	Community Total Motor Vehicle Licenses Issued (#)
15	Community School Enrolment (persons)
16	Community Business starts/failures

Source: Simons SSD & Cortex Consultants Inc. (1991).

- i) Economic activity in the community as measured by value of output, income and employment;
- ii) Distribution of economic benefits among residents;
- iii) Effect on traditional use of the forest by community;
- iv) Effect on social and/or cultural values;
- v) Community stability, which may include, in part, the above indicators; and
- vi) Quality of life.

Among these indicators (iv) and (vi) have a large social content, and therefore are left for further elaboration in the social assessment framework of the PAMF.

The last regional account (Account 7) is the Non-Commercial Values Account. This account will document the changes in the values not directly established by the market place. An economic measure of quantifiable values in this instance may be the value of net benefit to the region from activities such as recreation, nature viewing, sport fishing, among others.

Resource depletion may be another indicator that can be used to measure this account. However, this along with environmental indicators must be fully developed under the environmental assessment framework methodology development.

#### **4.3.3 Accounts with Provincial Accounting Stance**

Five accounts that are included for the province include economic efficiency, economic development, non-commercial values, fiscal impacts, and sustainable development.

The economic efficiency account (Account 8) is identical to that for the region, except that now benefits accruing to anywhere in the province are included. The indicators that can be used to

estimate this account include net benefits to the province, and the benefit cost ratio using provincial societal benefits and costs.

The Economic Development Account (Account 9) and Non-Commercial Value Account (Account 10) are also identical to those discussed under the regional accounting stance, except for the geographical scope.

Two new accounts that are introduced at the provincial level are Account 11 - Fiscal Impacts Account, and Account 12 - Sustainable Development Account. The fiscal impacts account will document provincial level revenues and expenditures under various management options. All direct, indirect, and induced revenues and expenditures will be included.

The sustainable development account will document long-term growth of the province as directly determined by various management options. The indicators to be used will include economic development measures (such as gross domestic product) adjusted for depletion of natural capital and for environmental degradation, and total net value added under the option.

All of the 12 accounts have one or more indicators. These, therefore, require following a methodology for their estimation. Development of this methodology is the subject of the next chapter.

## **Chapter 5**

### **DEVELOPMENT OF EVALUATION ACCOUNTS**

In order to apply the multiple accounts analysis (MAA), the multiple accounts framework (MAF] as presented in Table 4.2 needs to be described further. This description should include the procedure that should be followed to estimate various indicators, and information requirements for completing that task. This is accomplished in this chapter.

The chapter is divided into three major sections. Section 5.1 describes the two private accounts, followed by, in section 5.2, description of five regional accounts. The five provincial accounts are described in the last section of this Chapter.

#### **5.1 Development of Private Accounts**

Private accounts contain information on economic changes of concerns to the "private" decision makers. Any other changes are excluded from these accounts. For private decision making purposes, these accounts therefore are the most important accounts. Private sector activity in the PAMF is present for timber (through Weyerhaeuser Canada Ltd.), as well as for non-timber products. Each of these sub-accounts is described below.

##### **5.1.1 Economic Efficiency Sub-Account for Timber Products**

Economic efficiency is typically measured in terms of improvement of economic welfare of the constituents. Economic efficiency is gained if the net benefits to the decision-maker can be

increased, which may suggest either (i) to increase output for a given level of cost, or (ii) to decrease costs for a given level of output.

One of the major indicators of private economic efficiency is the net private benefit. In this case the term "private" needs to be defined. If it is defined as including Weyerhaeuser Canada, then the net private benefits would be measured as the value of producer surplus for the company. If one defines the private accounting stance to include the company, its various employees in different timber operations, as well as all private businesses of timber and timber products, the net private benefits, although still measured as producer surplus, would be an aggregate of individual producer surplus. At the very outset, the PAMF Association should decide the scope of this account -- i.e., Weyerhaeuser only or all timber related enterprises.

This indicator will require base-line data collection on the economic aspects of various types of timber related operations. In particular, for the PAMF, it should include. i) P.A. Pulp and Paper mill; ii) Big River Saw Mill; iii) loggers (not included as employees of Weyerhaeuser); iv) Other primary wood products producers; v) Other secondary wood products processors; and vi) fuelwood suppliers.

Producer surplus is defined as the area under the supply curve and the price of the product, as shown in Figure 5.1. Producer surplus is the area under the price for the product and the supply function (marginal cost). The supply function could be based on a short-run marginal cost curve (where fixed costs are not included) or long-run marginal costs (where the fixed costs are included, and return for management is imputed). Estimation of producer surplus would require a detailed knowledge on economics of various operations.

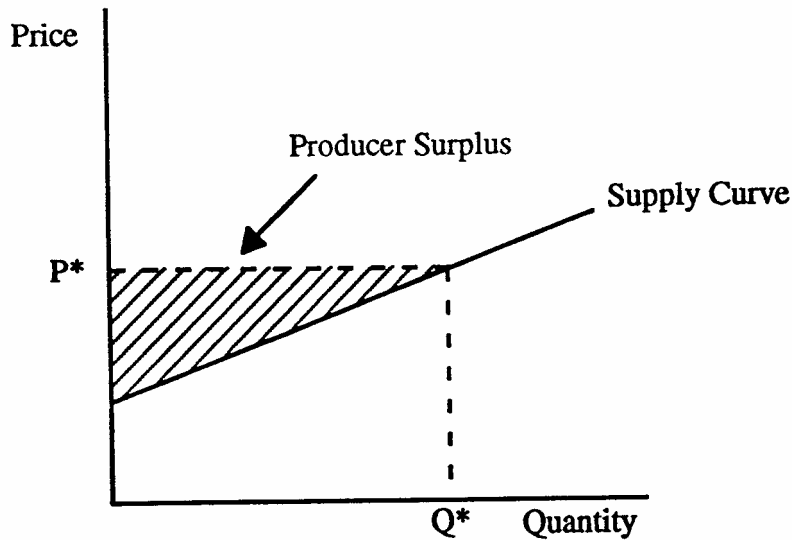


Figure 5.1: Concept of Producer Surplus

The net private benefit is applicable to short run changes. If there are long-run changes in producer surplus, these may need to be captured through a benefit-cost ratio. This requires the development of a benefit-cost analysis tool. The ratio is based on the following equation:

$$BCR = \frac{\sum_{t=D}^T \sum_{i=1}^n B_{ti} / (1+r)^t}{\sum_{t=D}^T \sum_{i=1}^n C_{ti} / (1+r)^t} \quad (5.1)$$

The  $B_{ti}$  is the benefit under a given management option during time period  $t$  and  $i^{\text{th}}$  number of the private stakeholders;  $C_{ti}$  is the cost for  $i^{\text{th}}$  stakeholder during time  $t$ ; and  $r$  is the discount rate. The number ( $n$ ) of private stakeholders under the option is decided by the scope of analysis. The life of the project ( $T$ ) will depend upon the length of time over which benefits and costs are realized as envisaged under the option.

Carrying out a benefit-cost analysis from a private accounting stance frequently necessitates elaborate calculations and detailed data requirements. Neither a generic nor a computerized methodology, therefore, is possible, and the analysis is left for future research in this area.

Two other indicators of private efficiency can be suggested. These are change in market shares, and value of export sales. These two indicators do not measure the economic efficiency directly; however, these may be of interest to the PAMF decision makers. These indicators require an analysis of current and potential markets, and relative comparative advantage information (relative to other major competitors). However, an indirect measurement of the first indicator can be "change in average cost" of producing timber. Such costs inevitably determine level of final sales including export sales of products, and affect the competitive position of the firm(s).

### **5.1.2 Private Economic Efficiency Account for Commercial Non-Timber Products**

Commercial non-timber products in the PAMF region could be grouped under three types. Type I would be those products that are obtained from the forest, and sold virtually in that form commercially. Type II products include those forest products which are sold commercially but with further processing; and Type III products include those where forest products are a small part of the total input package, and therefore are intermediate goods.

For the PAMF region, these types of products would include.

<b>Type I</b>	<b>Type II</b>	<b>Type III</b>
Trapping	Mushrooms, Berries	Grazing
Outfitting and Other Commercial Hunting Camps	Wild Crafting and Other Specialty Forest Products	Essential Oils
Wild Rice		

Each of the three types of products requires different types of estimation methodology.

Let us first start with the indicators for this account. Table 4.2 suggests two indicators: net private benefits, and private benefit cost ratio. These concepts have already been introduced under 5.1.1 and therefore would not be repeated.

The measurement of producer surplus as a measure of gross benefit may change somewhat depending upon the type of product. For Type I products, estimation would follow the same lines as for timber products. Some modifications may need to be made for the other two types of products.

For Type II products, one major problem is the multiplicity of products and enterprises. Developing a comprehensive list is beyond the scope of this report. However, a partial list would include: mushroom gathering, wild berry picking, collection of material for floral arrangements and other crafts, and collecting medicinal herbs. Data on economics of each one of these activities in the region are required to complete the task. In addition, scale of operations for each would also be needed in order to estimate the value of producer surplus.

For Type III products, valuation of benefit is more complex, and alternative methods need to be compared regarding their applicability. For example, in the case of grazing use of forest, the producer surplus can be estimated using "Alternative Cost" technique. Farmers may be asked what action they would undertake to replace the forage currently being obtained from the forest. Inevitably the replacement cost would be higher, forcing farmers to reduce the scale of their livestock operations (and in some cases even to get out of livestock operations). Let present supply function of livestock products in the region be  $S$ , as shown in figure 5.2. If farmers have to replace the forest's forage, the cost may rise and the new supply function may be  $S_1$ . Given farmers' derived

demand for forage, as shown by function D, the producer surplus that is lost is equal to the area “abcd” in figure 5.2. This would be equivalent to the value of grazing using the forest.

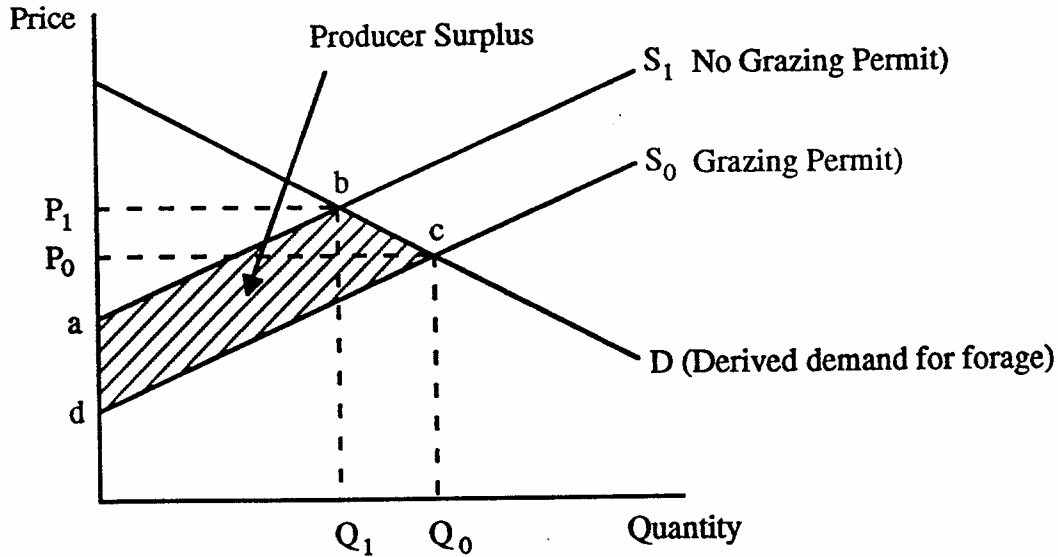


Figure 5.2: Economic Value of Grazing

The procedure for estimating the value of forest in producing essential oils can also be similar to the above procedure. However, on account of lack of information on this industry, such details cannot be finalized until more data on such operations, and on the relative economics of these operations are collected.

The benefit-cost ratio for this account would be estimated in an identical manner as in section 5.1.1, except the nature of uses to be included in the calculation would be different, and the benefits and costs would be determined as noted above.

## **5.2. Regional Accounts**

A region could be a conglomerate of several jurisdictions, and depending upon the selected one, the value of this account would be different. Three alternative scopes of a region are presented here: One, seven members of the PAMF Association; Two, communities with the PAMF region, and Three, an economic region relevant to the PA Model Forest. These definitions of regions lead to five sub-accounts; each of these is discussed below.

### **5.2.1 PAMF Association -- Economic Efficiency Account**

The indicator selected for measuring economic efficiency for the PAMF Association is that of net benefits. The measurement of this is similar to that presented earlier in this chapter. Given the membership in the Association, the estimates of economic efficiency would be different since accounting stance of different members may be different. Let us first discuss the accounting stance of the seven members of the PAMF Association. This is shown in Table 5.1.

The above list leads to a combination of accounting stances, and thus a potential for conflicts may exist. The national accounting stance would lead to inclusion of any economic benefits accruing to those outside the province of Saskatchewan besides the provincial. The provincial accounting stance would include all benefits to the people of the province. The local perspective would be that held by the P.A. National Park and the Montreal Lake Cree Nation. However, the Park's vision of society may be somewhat broader and may include people of Saskatchewan. It is conceivable that the accounting stance of the P.A. Grand Council and that of First Saskatchewan Indian Nation in the context of the PAMF might be limited to MLCN, and thus a need to estimate benefits to society beyond the MLCN may not exist. However, it is equally likely that these accounting stances may

**Table 5.1.**  
**Plausible Accounting Stance of Various Members**  
**of the Prince Albert Model Forest Association**

<b>Member</b>	<b>Accounting Stance</b>
Canadian Forestry Service Province of Saskatchewan	National Provincial, but could be narrowed down to Northern Saskatchewan
Prince Albert National Park	Local Society
Lake Waskesiu Businesses	Private
Weyerhaeuser Canada	Private
Montreal Lake Cree Nation	Aboriginal People Band Community
P. A. Grand Council	Aboriginal People in General but could be only Montreal Lake Cree Nation (MLCN)
First Saskatchewan Indian Nation	Aboriginal People in General but could be only MLCN
Canadian Institute of Forestry	None identifiable

include aboriginal communities beyond Montreal Lake and its other three satellite communities - Timber Bay, Weyakwin, and Little Red Reserve -- and in some cases, other northern Saskatchewan aboriginal people.

The fourth accounting stance is a private one, which is to include various operations of Weyerhaeuser, and business community at the Waskesiu Lake townsite.

The net benefits from a management option would be the summation of the benefits under each of the four accounting stances. Some benefits may be positive, while others negative (reflective

of costs to other stakeholders). The most critical question in this estimation would be the weights ( $w_i$ ) assigned to each of the accounting stances, as shown in equation (5.2).

$$\text{Net Benefit (PAMF Assoc.)} = \sum_i w_i \cdot NB_i \quad (5.2)$$

The weights may be equal for all members, or unequal. If  $w_i$  is equal to 1, the problem may still remain that of double counting, and representation. For example, since the Waskesiu Lake businesses are not represented, should it have a weight of one, or should it be combined with that of the P.A. National Park? Similar questions can be raised with respect to aboriginal people, and the three members representing them.

### **5.2.2 PAMF Regional Development Account**

The regional development account is measured through various economic impacts generated in the region under a management option. Traditional measures of such impacts are (i) Value of goods and services produced in the region; (ii) Level of income generated; (iii) Level of gross domestic product at market prices; and (iv) Level of employment. Without any other consideration, an option that provides the highest level of economic impacts is considered more desirable. One should note that economic impacts under this account are not the same as economic benefits noted in the previous accounts. Economic impacts suggest changes in economic measures; they do not check where these changes are desirable (which is benefit estimation) or not desirable (which are costs and deducted from the net benefit estimates).

Two critical decisions that are needed to implement this account are i) definition of the region; and ii) development of a tool (model) for economic impact estimation.

The definition of the region can be perhaps the least contested of the decisions. The most appropriate region would be that which contains the P.A. Model Forest. This 315,326 ha. of land includes part of the Weyerhaeuser Canada's Forest Management License Agreement (FMLA), the Montreal Lake Cree Nation's lands, and a part of the Prince Albert National Park. This region also includes two major population clusters: (i) community of Montreal Lake; and (ii) a seasonal to permanent community at Lake Waskesiu. The latter community houses some permanent employees of the PANP, plus, during the summer season, semi-permanent residents at cabins and commercial accommodations.

The second region that may be relevant to the Model Forest is the trade area associated with the PAMF. This trade region would include the city of Prince Albert, as well as Big River -- major destinations of timber harvested within the PAMF. In addition, many of the economic purchases by PAMF residents are made outside its boundaries. A 48 mile (73 km) radius region to include the city of Prince Albert to the south from the center of the PAMF should capture the majority of the economic transactions -- both inter-industry and those between consumers and goods and services producing sectors.

Ideally, analysis of the regional impacts should be done for both the regions. However, the model for the PAMF will only be possible after a considerable primary data collection on six fronts:

- i) Detailed expenditure patterns of families living at Waskesiu Lake permanently as well as those visiting;
- ii) Detailed expenditures of P.A. National Park on non-salary items of the annual budget;
- iii) Detailed expenditures of private businesses at the Waskesiu Lake;
- iv) Family expenditure patterns for the Montreal Lake residents,

- v) Detailed expenditure patterns of commercial establishments at the Montreal Lake (to include the Montreal Lake Development Corporation and other private stores); and
- vi) Detailed financing and expenditures of Band operations and other quasi-public institutions such as schools, clinics, and others.

The above data collection effort can be extensive and, therefore, somewhat overwhelming. However, on account of confidentiality regulation of the provincial and federal institution, such data cannot be obtained through secondary sources and every effort need to be made to assemble these data through PAMF Association members.

The second major area of research for this account is the development of a model. The model that is ideally suited for economic impact estimation is an input-output model. An input-output (I-O) model is based on a record of all economic purchases and sales that take place during a year (a typical accounting period). This information is technically called a transactions table, and becomes the basis for creation of a set of multipliers. The multiplier is the relationship that displays the total magnitude of total economic impact associated with some direct expenditures. The direct expenditures are those associated with a particular management option,

An ideal input-output model for this type of analysis would be an inter-regional I-O model. The regions should include: PAMF, PAMF Economic region, and rest-of-the-province. However, this will be a very data intensive exercise, since trade flows from one region to the other will have to be collected before a meaningful interregional I-O model can be estimated.

For the sake of keeping data collection at an affordable stage, a multiple region I-O model is suggested. This model would be able to estimate impact on the 3 regions, but would have no capability to predict benefits resulting from interregional trade and ensuring feedback effects.

The I-O model should be linked to an Employment Module. This module will link changes in output (value of goods and services produced) to hiring of manpower to carry out this activity.

### **5.2.3 PAMF Regional Non-Aboriginal Community Account**

The only non-aboriginal community within the PAMF is the Waskesiu Lake townsite. Alternative ways in which PAMF is managed could have significant economic effects on this community. Two indicators were selected for estimating this type of community's account: community stability, and quality of life. Both of these are interdisciplinary concepts and require joint activities in the field of economics and sociology.

For community viability changes, one needs several types of information;

- i) Baseline conditions leading to a community's viability status; and
- ii) Change in the parameters that enter the viability calculation.

Development of community viability status could be done through the use of an index. The weights for the index can be calculated using a principal component analysis. The analysis should be based on historical data for northern Saskatchewan communities. The selection of the variables, although somewhat guided by availability of data, should include employment, demographic and economic growth, and other social variables. A concept of "comparable communities" can be used to calculate the weights. A comparable community must have similar socio-economic characteristics as those in the study area.

Quality of life can also be presented as an index. However, this would involve three major tasks. Task one would be to identify data variables to include in the index. Although several attempts have been made, the task still appears to be at the discretion of the decision-maker. More

examples can be found in the DECD (1984), and SIA methodologies (see Fitzsimmons *et al.*, 1977). The DECD does not propose an explicit quality of life, but various attributes are presented as social indicators. These indicators include quality of life aspects, such as health, education and learning, employment, quality of working life, time and leisure, command over goods and services, physical environment, social environment, and personal safety. The Fitzsimmons *et al.* procedure for constructing an index suggests including various quality of life dimensions. These include: psychological well-being and situation descriptors. The latter is based on four categories of descriptors: economic, social, leisure, and political.

The second task will be to estimate the weights for the index. A procedure similar to that for community viability index can be followed in the construction of quality of life index. The third step would be to collect data on various measures included in the index under various management options being contemplated. This task will require collaboration between sociologist(s) and economist(s).

#### **5.2.4 PAMF Region Aboriginal Account**

The aboriginal account can include a variety of indicators, but five were suggested in Chapter 4. For each of these, estimation methods are provided below.

Economic Development: Economic development for Montreal Lake can be measured through:

- i) increased employment of the local people;
- ii) additional incomes generated within the community. This income may only be direct income initially. However, if an input-output for the PAMF region is developed, this may include the total income level -- direct, indirect, and induced income levels; and,

- iii) increased value of goods and services produced in the community. Again, life incomes, output may be direct, or total output.

In order to measure this indicator, data on how the above criteria change under each management option would be required.

Distribution of Benefits: This indicator can be estimated by examining the change in economic status of those who receive the benefits before and after the management option is put in place. The distribution criteria will suggest that if an economically depressed group of people receive benefits, this is more desirable, in contrast to an option where those already better off continue receiving such benefits.

Effect on Traditional Forest Use: Traditional forest use can be defined to include activities such as trapping, subsistence food gathering, hunting medicinal herbs, spiritual use and other related non-commercial activities carried out by aboriginal people of Montreal Lake. In order to examine this aspect of the aboriginal account, data on both the present situation as well as that which results from of adopting a management option will need to be collected.

Effect on Community Stability and Quality of Life: These indicators are similar in nature to those discussed in the context of non-aboriginal communities. The only difference will be in terms of data used for baseline indexes and for estimation of weights. Data must be based on comparable aboriginal communities.

A major problem may arise in the estimation of this account if a single value judgement is to be made. This will require development of weights for each of five indicators. In the absence of such weights, each individual indicator may have to be displayed separately.

### **5.2.5 Non-Commercial Regional Values Account**

This account would include three indicators: (i) Effect on non-market goods, (ii) Depletion of forests, and (iii) Environmental values. Each of these is discussed here in the order presented.

Effect on Production of Non-Market Goods and Services: The evaluation of this criterion would indicate of the effect of the option on non-market goods. Three non-market goods that have economic value include: (i) Recreation; (ii) Aesthetic pleasure; and (iii) Non-use values.

In order to evaluate the first one, data must be collected on how such activities are currently taking place, and how these would change under a given option. The change in economic value of recreation would be based on change in the person-days of recreational activity and the average value per person-day.

Economic value of aesthetic pleasure losses can also be estimated through an assessment of how people perceive such losses, and the value they place on these losses.

The non-use values are more difficult to include in these accounts. Since these reflect the existence and bequest values, such values will be involved only if forests reach a point where such non-use values are threatened.

Effect on Resource Depletion: Value of resource depletion of interest to the PAMF is that of forests. The value of resource depletion under a given option will need to be estimated in discounted present value terms.

In order to calculate this value, an accurate timber supply model is essential. The model can predict the quantities of timber at different periods of time in the PAMF. The second set of data would concern prices of forest resources in the future. Calculation of future prices would require some type of price forecasting model. In the absence of such a model, prices may be held constant in terms of the year of analysis.

Environmental Values: This part of the account would need to be specified in conjunction with ecologists. Some of the environmental values would have economic values, while for the rest a precise economic value may not be specified at present. One of the environmental values may be for biodiversity. Such estimates have been suggested by Pearce and Moran (1994).

Since all the above values are in dollar terms, the aggregate estimates are easy to assess. However, since many environmental values are unpriced, and some even non-monetizable, integration of economic and environmental is still a major challenge.

### **5.3 Provincial Accounts**

Provincial accounts are almost parallel to the regional accounts with the exception of the two community level accounts. Let us discuss each of these accounts.

### **5.3.1 Provincial Economic Efficient Account**

This account will document any net benefits of a management option regardless of its place of incidence within the province. This account differs from the regional economic efficiency in one respect. In addition to regional net benefits, these include those on the rest of the province, yielding total provincial level net benefits.

Method of estimation of net benefits would be identical to that for regional economic efficiency account. Producer surplus will need to be estimated for activities which are directly affected by the given option.

The benefit-cost analysis for an option will also proceed on lines similar to those discussed in connection with regional economic efficiency accounts. The benefits over the life of the plan under the options, as well as various categories of costs will need to be estimated as a first step. Exact specification of what activities should be included in the benefit-cost ratio calculation cannot be done without first specifying the option -- its scope, nature, and magnitude.

One major difference between the benefit-cost analysis in Section 5.2.1 and the present one, is that of its scope. From a provincial standpoint an extended social accounting stance is more appropriate. The scope of the "Social" will still be people of the province. However, in addition to economic benefits (and costs), those resulting through changes in the ecosystem should be included here. This inclusion here would, of course, be subject to monetizability of the ecosystem related changes. The non-monetizable ecosystem related changes should be included under the provincial non-commercial values accounts.

Estimation of this account would involve the following major steps:

- i) Determine the scope of analysis in light of the direct beneficiaries of the given option. To the extent possible, both commercial and non-commercial beneficiaries should be included in the analysis. Relevant environmental changes that are monetizable should also be identified;
- ii) Estimation of economic benefits and costs for each commercial beneficiaries;
- iii) Imputation of benefits and costs for various non-market based non-commercial beneficiaries;
- iv) Monetization of ecosystem related benefits and costs;
- v) Discounting and determining net present value of benefits and costs; and,
- vi) Estimation of the benefit-cost ratio.

The above methodology, although straight-forward, could be somewhat data intensive. In order to estimate change in any individual category of benefits (or costs) under a given option, analysis and modelling must proceed. These models should be capable of estimating physical changes at least, if not economic value changes. More emphasis on bio-econommic, or econo-ecological models will be well rewarding.

### **5.3.2 Provincial Economic Development Account**

Provincial economic development account will measure the economic impacts of a given option on the province. These impacts will include not only direct impacts, but also indirect and induced impacts. In addition, all forward and backward linkages of the option should be included in order to assess this account accurately.

Estimation of a provincial input-output model is required. The model would be identical to the regional one, except now based on provincial level economic transactions table. A set of provincial level multipliers can be estimated from this model. In addition, the model should also include an employment module.

The procedure for estimation of economic impact analysis includes the following steps:

- i) Identify the scope of activities that may be affected under the proposed option;
- ii) Estimate the nature and size of the economic change associated with the option. This may be in two alternative forms: (i) direct production of goods and services, or direct income, and direct employment; and (ii) detailed breakdown of total output (or expenditures) by major commodities (goods and services),
- iii) Estimate total impact on provincial output, income, and employment using provincial level multipliers. Such impacts are those based on backward linkages;
- iv) Identify all forward linkages (if any) of the given option;
- v) Estimate any changes in these forward linked industries;
- vi) Estimate provincial level impacts using multipliers; and,
- vii) Add economic impacts in steps three and six above to arrive at total provincial impacts of a given option.

For each individual option, although the above procedure would be applicable, steps one and four would be different, and therefore are the most critical ones.

Another indicator of economic development in this Account is the distribution of income in the province. If data are available on existing income distribution, numerical measure such as Gini

Coefficient can be estimated. Change in the numerical value of the coefficient will determine whether the option will improve the income distribution or not.

An alternative to the above procedure is the development of provincial (and regional) level Social Accounting Matrices (SAM). These show the flow of money in a given jurisdiction. Such models can be developed for a country (such as that by Kerning 1994), or for an Indian Reservation (as estimated by Trosper 1986 for U.S.A.).

### **5.3.3 Provincial Non-Commercial and Environmental Values Account**

This account contains three major indicators. (i) Non-market goods affected, (ii) Resource depletion values, and (iii) Environmental values. At the outset, every attempt should be made to avoid double-counting with the provincial economic efficiency account, or other accounts in the estimation of this account.

The level of non-market goods affected under the option here will be only those for which an economic value has not been assigned. Such may include improvement in water supply or quality, change in aesthetics leading to recreational use of forests, spiritual use of forests, and level or quality of sport fishing, among others. The changes will be noted in either physical units or in a qualitative manner.

Resource depletion values and environmental values will include any damages to resources that may be significant to the province. Such may include unique features of resource, loss of biodiversity, and similar other indicators. This part of the account should be planned jointly by the study economist and the ecologist.

### **5.3.4 Provincial Fiscal Impacts Account**

The provincial government may be affected more directly by alternative management options through fiscal impacts. Different options may have a different impact on government revenues, and expenditures, and, therefore, may leave the net financial effect desirable or otherwise.

Fiscal impact estimation can be done in a cursory manner or through complex models. Models have been developed which link the economic development activity and resulting employment with population changes which bring about linkages with government revenues and expenditures. Such a model for North Dakota is reported by Leistriz *et al.* (1994-95). Three basic steps that are involved in estimating this account are:

- i) Estimate provincial level revenues. Revenues can be of two broad types -- direct and indirect. In forestry operations, direct revenues are derived from the stumpage charged. Indirect revenues may be through taxes levied by the government, such as sales tax and entertainment tax on recreation and sale of goods. Income tax would also fall into the indirect taxes category. Some of the revenues may be directly connected to level of economic activity. In such cases, use of the input-output model may also be quite appropriate.
- ii) Estimate the effect of the option on government expenditures. Expenditures may also be divided into direct and indirect. Direct expenditures include those commitments which are related to the forest resources. These may include provision of access, or fire prevention. Indirect expenditures are those which are incurred not on the direct resource related activities, but through indirect effects. For example, creation of additional employment under an option may lead to less compensation paid to unemployed or those on social assistance.

- iii) Estimate the net fiscal impact of the option on the provincial government by subtracting the expenditures from revenues.

The above analysis can be done on an annual basis or results can be expressed over the life of the project under the given option. If estimates are not annual, net present value of both revenues and expenditures should be derived using an appropriate discount rate.

### **5.3.5 Provincial Sustainable Development Account**

Among all the accounts discussed in this chapter, this account is the most problematic. Difficulties lie in terms of defining both sustainable development and precise measurements. Nonetheless an attempt must be made.

Daly and Cobb (1989) have proposed an index of sustainable economic welfare (ISEW), which can be estimated for the province. The ISEW requires correction in the conventional gross domestic product for depletion of natural capital, pollution effects, and income distribution effects. Also any double counting through inclusion of defensive expenditures is also corrected. Implementation of this concept requires substantial data collection, some of which may not be readily available.

Nilsson and Sallnas (1994) have suggested a measure of net value added, which is estimated as follows:

$$\begin{aligned} \text{Net Product Value} &= \text{Gross Value of Timber} \\ &+ \text{Investment and maintenance} \\ &- \text{Intermediate consumption} \\ &- \text{Net depreciation of fixed capital.} \end{aligned}$$

$$\begin{aligned} \text{Total Net Value Added} &= \text{Net Product Value} \\ &+ \text{Increase in growing stock} \\ &+ \text{Recreation, tourism; landscape Soil and Water Functions} \\ &+ \text{Biodiversity} \\ &+ \text{Hunting, mushrooms, berries} \\ &+ \text{Carbon fixation} \\ &+ \text{Existence and bequest values} \end{aligned}$$

The estimation of total net value added under alternative management options will provide the PAMF an estimate of this account.

## **Chapter 6**

### **TOWARDS AN INTEGRATED ASSESSMENT**

Development of an economic assessment framework is only one step towards achieving an integrated assessment of forest management options. Integrated assessment model is a tool in the policy process to help understand the implications of taking a specific action or failing to take any action. A major purpose of an integrated assessment model is to organize complex pieces of information of interest to a decision-maker which may have origin in various disciplines. In the context of the PAMF, since sustainability of forests is a major guiding principle, three major disciplines involved are economics, sociology, and ecology.

The purpose of this chapter is to address briefly the integrated assessment of PAMF forest management options, and the place of economic assessment framework as presented in this report. Integrated assessment of PAMF management options would help clarify the implications of taking a specific action (or failing to take any action). Each option would result in a certain change in the manner the PAMF region is used and what activities are undertaken. Each of these activities would lead to some socio-economic-political effects, some effects on the ecosystem of the region, as well as some implications for the global environment. A schematic presentation of this assessment process is shown in Figure 6.1. The activities undertaken in a given option, lead to forest use (in terms of timber product use as well as non-timber products use). Both commercial and noncommercial (furthermore, including both traditional and non-market goods) products are included in this use. Depending upon the nature of this use, there are bound to be two major types of effects - effects on the human system, and those on the ecosystem. However, many of these effects are

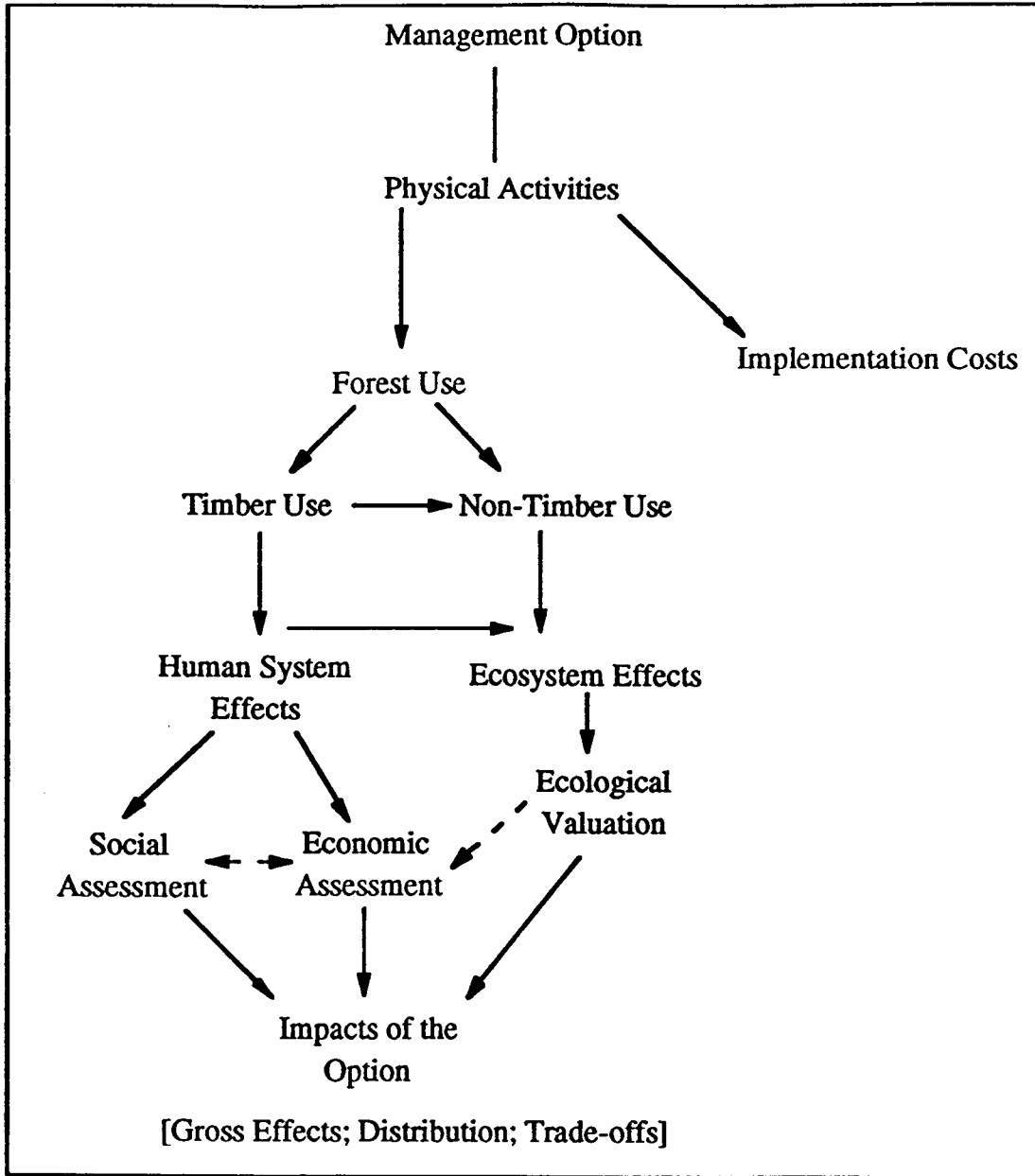


Figure 6.1: Schematic Presentation of the Integrated Assessment Model for the PAMF

interdependent, particularly in the long run. Assessment of the social, economic, and ecological changes constitutes the heart of management option assessment.

The two other assessments -- social and ecosystem, require the development of an assessment framework similar to that presented in this report. These frameworks should be parallel, and, in some ways, complement the economic assessment framework. The Multiple Accounts Analysis process, as suggested in this report, is conducive to incorporating social and ecosystem criteria. If such social and ecosystem indicators are identified, and presented together with economic indicators, this would lead to an integrated assessment of the PAMF management options.

The heart of a comprehensive impact assessment is the integrated model development, and collection of data for that purpose. The emerging field of ecological economics could lead to better methods of integrating economic development and environmental services. Much more needs to be achieved in terms of integrating social and economic impacts of forest management.



## ***REFERENCES***

- Bakkes, J.A., G.J. Vanden Born, J.C. Helder, R.J. Swart, C.W. Hope, and J.D.E. Parker. (1994) An Overview of Environmental Indicators: State of the Art and Perspectives, Bilthoven, The Netherlands: National Institute of Public Health and Environmental Protection.
- Boadway, R.W. and D.E. Wildason. (1984) Public Sector Economics. Toronto: Little, Brown and Co.
- Bruntland, G.H., Chair of the World Commission on Environment and Development. (1987) Our Common Future. New York: Oxford University Press.
- Canadian Forest Service. (Undated) "Criteria and Indicators for the Sustainable Management of Forests: The Canadian Process." Hull, Quebec.
- Carley, M. (1982) Social Measurement and Social Indicators London: Allen & Unwin.
- Carlisle, E. (1972) "The Conceptual Structure of Social Indicators." in A. Schonfield and S. Shaw (eds.) Social Indicators and Social Policy. Long: Heinemann Educational Books.
- Christensen, P. (1991) "Driving Forces, Increasing Returns and Ecological Sustainability" in R. Costanza (ed.) Ecological Economics: The Science and Management of Sustainability. New York: Columbia University Press.
- Daly, H.E. and J.B. Cobb, Jr. (1989) For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future. Boston: Beacon.
- Fitzimmons, L.I. Stuart and P.C. Wolff. (1977) Social Assessment Manual. Boulder, Colorado: Westview Press.
- Heal, G. (1985) "The Intertemporal Problem." in D.W. Bromley (ed.) Natural Resource Economics. Boston: Kluwer Nijhoff Publishing.
- Johnston, G.M. (1988) "The Role of Economics in Natural Resource and Environmental Policy Analysis." in G.M. Johnston, D. Freshwater, and P. Favero (eds.) Natural Resource and Environmental Policy Analysis. Boulder, Colorado: Westview Press.
- Keuning, S.J. (1994) "The SAM and Beyond: Open, SESAME!" Economic Systems Research, 6(1):21-50.
- Kulshreshtha, S.N., J.K. Siemens, W.S.M. Doell and H. V. Walker. (1994) Economic Perspective on the Prince Albert Model Forest Region of Saskatchewan. Prince Albert: The Prince Albert Model Forest Association.

- Kulshreshtha, S.N., B.F. Moriarty and H. V. Walker. (1994) Considerations Involved in Developing an Economic Assessment Framework for the Prince Albert Model Forest Region. Prince Albert: The Prince Albert Model Forest Association Inc.
- Kulshreshtha, S.N. and H.V. Walker. (1993) A Strategic Work Plan for the Prince Albert Model Forest. Prince Albert: PAMF Association Inc.
- Land, K.C. (1975) "Theories, Models and Indicators of Social Change." International Social Science Journal, 27(1): 7-37.
- Leat, P.N.K\_ and N. Chalmers. (1991) "Analyzing Agricultural Adjustment in Grampian Using an Input-Output Model of the Agriculture and Food Complex." in P. Midmore (ed.), Input-Output Models in the Agriculture Sector. Singapore: Avebury.
- Leistriz, F.L., R.C. Cron, and R.R. Hamm. (1994-95) "A Microcomputer Model for Assessing Socio-economic Impacts of Development Projects." Impact Assessment 12(4); 373-84.
- Marvin Shaffer and Associates Ltd. (1991) Socio-Economic Evaluation of Old Growth Conservation Strategies. FRDA Report, Victoria, B.C.
- Nilsson, S. and D. Sallnas. (1994) "Forestry Impacts and Economic Benefits by Abatements in Slovenia," in M. Amann, S. Nilsson, W. Schopp, and O. Sallnas, Impacts on Forestry and Economic Benefits by Sulfur Abatement in the Sostanj Region of Slovenia. Laxenburg, Austria: International Institute for Applied Systems Analysis.
- OECD Organization for Economic Cooperation and Development. (1993) "Group on the State of the Environment Workshop on Indicators for Use in Environmental Performance Reviews". Draft Synthesis Report, Paris.
- OECD. (1982) The OECD List of Social Indicators. Paris: Organization for Economic Cooperation and Development.
- Pearce, D. and D. Moran. (1994) The Economic Value of Biodiversity. London: Earthscan Publications Ltd.
- Province of British Columbia. (1992) Social and Economic Impact Assessment of Forest Land Management Options in British Columbia: Interim Evaluation Guidelines. Victoria, B.C.
- Rossi, R.J. and K.J. Gilmartin. (1980) The Handbook of Social Indicators: Sources Characteristic & Analysis New York: Garland STPM Press.
- Simons Strategic Services Division and Cortex Consultants Inc. (1991) Community Stability in Forest Sector Dependent Communities in British Columbia Vancouver, B.C.

- Trosper, R.L. (1986) "Guidelines for Project Evaluation on Indian Reservations. An Application of Cost-Benefit Analysis and Social Accounting Matrices." A Compendium of Papers for Committee of Indian Affairs. Washington, D.C.: U.S. Government Printing Office.
- U.S. Water Resources Council. (1983) Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Washington, D.C.
- Young, M.D. (1992) Sustainable Investment and Resource Use. UNESCO, Paris, and Park Ridge, NJ: The Panthenon Publishing Group.