MEASURING SUSTAINABLE DEVELOPMENT:

Application Of The Genuine Progress Index To Nova Scotia

PROGRESS REPORT AND FUTURE DIRECTIONS

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CONTENTS

III PROJECT DEVELOPMENT: 1998-1999 *p 72*

IV POLICY RELEVANCE *p 119*

V MEETING THE OBJECTIVES OF THE ECONOMIC DIVERSIFICATION AGREEMENT *p 129*

APPENDICES

I BACKGROUND

1. Limitations of the GDP

The Gross Domestic Product (GDP), as an aggregation of the market value of all goods and services, was first used during the second world war to measure total wartime production. It was not intended, even by its architects, to be used as it often is today —as a composite index of economic progress, well-being or prosperity. This project arose from an understanding of the shortcomings of the GDP, which are widely acknowledged today, and the recent development of more comprehensive and precise accounting methods.

Because it excludes nonmonetary production, the GDP records some shifts in productive activity (from parenting to child-care, home-cooking to eating out, unpaid to paid housework) as economic growth, even though these shifts may not alter total production. Conversely, recessionary times generally produce a shift of activity to the informal economy, which the GDP would register as a decline in production. The value of volunteer work, likewise, is not counted in the GDP, despite its important contribution to economic and social welfare.

Further, productivity gains may result in greater output *or* increased leisure, but the GDP counts only the former, thereby potentially masking longer working hours. Both the above omissions have important implications for the changing role of women, who have entered the paid workforce in growing numbers without a corresponding decline in their share of unpaid work.

Thirdly, because it does not account for income distribution, GDP growth may also mask growing inequality. The Brazilian "economic miracle", for example, produced dramatic GDP growth even as 40% of the population experienced an absolute decline in living standards.

As a measure of quantitative growth alone, the GDP also fails to account for qualitative changes, both in the mix of economic activity and in the quality of consumer durables. Thus, paradoxically, increases in crime, divorce and pollution add to the GDP, and there is no recorded relationship between the cost of consumer durables and the quality of services they provide. In fact, the quicker things wear out and have to be replaced, the better for the GDP.

Indeed, an activity that detracts from welfare can actually contribute to economic growth several times over. For example, a toxic spill adds to the GDP in the manufacture, sale and transportation of the toxin, in the cleanup costs and again in the subsequent lawsuits, medical costs, media reporting and environmental repair. Relying on a quantitative index as a measure of progress will inevitably produce the anomalies that led Robert Kennedy to remark that the GDP "measures everything, in short, except that which makes life worthwhile."

Perhaps most important, by failing to count natural and human resources as capital assets subject to depletion and depreciation, the GDP can send misleading signals to policy makers. Thus, massive fish exports are registered as growth but the depletion of fish stocks is not registered in the accounts.

A recent joint declaration by 400 leading economists, including Nobel laureates, remarked:

> *Since the GDP measures only the quantity of market activity without accounting for the social and ecological costs involved, it is both inadequate and misleading as a measure of true prosperity....New indicators of progress are urgently needed to guide our society....The Genuine Progress Index (GPI) is an important step in this direction.*

2. The Development of Expanded Accounts

Since the early 1970s significant progress has been made in remedying these flaws. Initiatives by the U.N., the World Bank, the O.E.C.D., the World Resources Institute, and many leading research institutes and distinguished economists, have advanced natural resource accounting to the point where even valuations of nonmarket ecological services can been included in the national accounts, as the government of Norway has demonstrated. For example, some studies have calculated values for forests as carbon sinks according to the costs of reducing carbon dioxide emissions by equivalent proportions to the carbon sequestration capacity of different forest species.

In addition, some composite indices, (like the Genuine Progress Index (GPI), the Index of Sustainable Economic Welfare, and the Measure of Economic Welfare), now account for unpaid work, income distribution, changes in free time, the durability of consumer goods and the value of natural capital, and distinguish direct contributions to economic welfare from defensive and intermediate expenditures and from economic activities that produce an actual decline in well-being.

In 1993, the United Nations, World Bank, International Monetary Fund, OECD, and the Commission of the European Communities jointly issued a new set of internationally accepted guidelines for the preparation of national accounts -- The System of National Accounts 1993. For the first time, international guidelines prescribed that natural resources should be incorporated into government balance sheet accounts.

In fact, the guidelines prescribed the development of a "satellite system for integrated environmental and economic accounting", to make explicit environmental protection expenditures, to link resource use and waste production to economic data and to calculate an environmentally adjusted Net Domestic Product to account for natural resource depletion and environmental degradation.

In accordance with this goal, the World Bank in 1997 published Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development, and Statistics Canada released on December 4, 1997, the new Canadian System of Environmental and Resource Accounts, which will be incorporated into the country's national balance sheets and input-output accounts. In fact, a major goal of Statistics Canada's new Environmental Protection Expenditure Accounts is "to provide those who might be interested in calculating an environmentally-adjusted GDP along these lines with the information necessary to do so."

In short, there is now a significant global movement to remedy some of the shortcomings of the GDP and to incorporate critical social and environmental information in new sets of expanded accounts. The following countries have taken the lead in this effort: Norway, Finland, Germany, Australia, Denmark, The Netherlands, Sweden and France. As a result of these international initiatives, there are now excellent models and methodologies available, and a sound basis for international comparability.

Needless to say, continuous improvements are needed in the methodologies of all these indices, but they share the advantage of acknowledging the complexity of economic,

social and environmental linkages in assessing and measuring progress and well-being. They are best taken as a basic flexible approach to more accurate and precise accounting subject to ongoing refinements in valuation techniques, rather than as a rigid formula or system.

For this reason the authors of the original GPI did not trademark the term, and our use of it here indicates acceptance of its basic principles rather than any intent to replicate its methodologies. In fact this study draws on a wide range of valuation methods developed by Statistics Canada and other national statistical agencies, international organizations, and respected research institutes and individual experts, to ensure both national and international comparability and also direct relevance to Nova Scotia conditions.

3. Sustainability as an Integrating Theme

The integrating theme of the new methods of accounting is the view of "sustainability". In contrast to the short term changes in quantitative growth tracked by the GDP, sustainable development acknowledges the dependence of the human economic subsystem on an encompassing ecosystem and our responsibility to future generations. Economic activity is valued according to long-term qualitative environmental, social and lifestyle standards.

Perhaps the greatest challenge of this view to the traditional economic thinking which the GDP reflects, is its recognition that progress and well-being may, in some cases, depend on limits to growth rather than continued economic expansion. Thus, sustainability has both ecological dimensions, —the necessity to live within the carrying capacity of our natural resource base and waste assimilation capabilities --, and social components concerned with the quality of life, such as the balance between increased output and the value of leisure and the value of human capital. Sustainability recognizes that social stresses may undermine future prosperity.

It is argued that the measurement of sustainable development has a strong basis in economic theory (Hicksian income), in science (the recognition of ecological life support services, of finite carrying capacity and maximum sustainable yields in resource exploitation), and in ethics (inter- and intragenerational equity). Increasingly, it also has a legal basis both in domestic legislation setting targets, standards and thresholds for environmental protection and waste reduction and in Canada's international commitments.

In fact, Agenda 21, the concluding document of the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, explicitly commits all 178 signatory countries to expand their national statistical accounts by including both environmental factors and unpaid work. The Nova Scotia GPI project, in effect, helps to operationalize Canada's national and international commitments to UNCED, to the internationally recognized System of National Accounts, and to the fundamental goal of sustainable development as it is increasingly integrated into the structure of legislation and administration.

For example, beginning in December 1997, each federal government department is required to submit a Sustainable Development Strategy to the Office of the Commissioner of the Environment and Sustainable Development, a recently formed branch of the Office of the Auditor General. These strategies will require measures and indicators of sustainability.

Presenting its new Natural Resource Stock Accounts, Statistics Canada notes (Cat. no. 16-505-GPE):

> *Canadians now recognize that their natural resource base is finite and that it must be managed for the benefit of both current and future generations. This recognition is translating more and more often into economic policy that looks beyond the conventional orientation or economic growth, setting instead targets for sustainable development.*

Since businesses, governments and individuals take their signals from the system of financial incentives and penalties, the vital link in moving towards more sustainable development in actual practice is an economic accounting system which incorporates environmental and social benefits and costs. That in turn is the fundamental basis for taxation systems, subsidies, pricing structures and other policy tools capable of encouraging actions that will ensure future prosperity.

A recent National Round Table report on Maritime woodlots, for example, noted that current accounting practices actually encourage woodlot owners in the province to harvest unsustainably. The report warned of serious consequences to the forest industry in the absence of full-cost accounting procedures reflected in the structure of taxes and subsidies. The new measures of progress are clearly timely and necessary supplements to the GDP.

4. Investment-Oriented Accounting

In order to measure sustainable development, accounting systems must take an investment-oriented rather than consumption-driven view of economic activity. Instead of the 19th century division of productive factors into land, labour and capital, which still dominates much conventional economic analysis, the newer investment-guided accounts of sustainable development see *all* productive factors as capital —natural, human, produced and social assets.

Natural capital includes resources and ecosystem functions; human capital includes the health and education of the labour force; man-made or produced capital includes plant, equipment and infrastructure; and social and cultural capital includes social institutions, community stability and political processes.

Though harder to measure in monetary terms than man-made capital, natural, human and social capital are equally subject to depreciation and require new investments if they are to provide a flow of services into the future. Thus the increasing importance of knowledge and information as productive factors in an era of rapid technological change require investments in human capital, such as staff training and skills upgrading. Unlike earlier eras where natural resources appeared limitless, we recognize today that excess depreciation and depletion of natural capital carries long-term economic costs, and that resources must be valued and maintained for long-term prosperity.

In short, accounting systems designed to measure sustainable development necessarily adopt an investment-oriented approach. Their basic method of valuation is similar to the insurance practice of setting current premiums according to past empirical evidence and the estimation of likely future benefits and costs.

In common with prudent investment and future-oriented strategies, such accounting systems of sustainable development incorporate uncertainty by adopting conservative valuation procedures based on the "precautionary principle". For example, rates of

depreciation for education are established that recognize excessive disinvestment in human capital as potential loss of competitiveness. Conversely, frequent high-quality re-training programs and investments in appropriate education are measured not just as current costs but as potential future benefits.

5. The Nova Scotia Pilot Study

Section V of the Canada-Nova Scotia Cooperation Agreement on Economic Diversification states as primary objectives:

> *"economic research and analysis, ...undertaking studies, surveys, analysis and case studies to either develop better analytical tools, or further our understanding of the provincial economy..."*

and

> *"improving economic infrastructure that lays the foundation for broad based economic development in the province."*

To further these objectives, funding of $31,800 was approved in July, 1997 by the Nova Scotia Department of Economic Development and Tourism and A.C.O.A., to explore the development of an advanced economic accounting system for Nova Scotia capable of providing more accurate information to assist policy makers and business leaders in responding creatively to the demands of the new economy. This initial feasibility study has been undertaken by GPI Atlantic, a non-profit research institute set up by faculty and graduate students at Saint Mary's University for the specific purpose of creating an index of sustainable development and applying the new accounting methods to the Atlantic region, beginning with Nova Scotia.

The project parallels Statistics Canada's own interest in developing expanded economic accounts, such as the new Canadian System of Environmental and Resource Accounts. It also parallels recent initiatives by the federal government that require each federal department to submit a Sustainable Development Strategy, beginning in December 1997, to the Office of the Commissioner of the Environment and Sustainable Development, a newly formed branch of the Office of the Auditor-General. These strategies will require measures or indicators of sustainability.

For these reasons, and as the result of ongoing consultations and exchanges of information on data and methodology, Statistics Canada in Ottawa, with the approval of the Assistant Chief Statistician, has decided to recognize the Nova Scotia initiative as a "pilot project" with potential applicability to the country as a whole. If it chooses, Nova Scotia would, in effect, become the first province to apply the new accounting methods in a systematic way. Since Statistics Canada is itself regarded as the leading statistical agency in the world, the Nova Scotia project also has potential as a model internationally.

Years of research into new methodologies and the availability of advanced computer technology and data on environmental, social and economic linkages are current advantages that did not exist when the GDP was introduced, and that make it possible to develop more comprehensive systems of accounting today. As the knowledge base for a sustainable development strategy, the new accounts also have tremendous policy potential for Nova Scotia (see chapter IV).

The fundamental goal of this project, to be explained in greater detail in chapter III, is therefore to establish a comprehensive framework for a practical policy-relevant index of sustainable development for Nova Scotia, and to generate enough basic data in several core sectors of the accounts to demonstrate the viability and usefulness of the index for policy purposes.

Clearly it will take several years to develop the index fully and to generate complete data sets for each sector. Even then the index should always be considered a work-in-progress subject to improved valuation methods and more accurate, detailed and comprehensive data as they become available.

The preliminary goal is to have the index ready for demonstration purposes in rudimentary working form by the end of 1999. In order to save time, already existing data from official, recognized and established sources will be used wherever possible. No new data will be generated during this stage, except for a planned survey to establish consensus on the fundamental values, purposes and objectives embodied in the index. A sampling of representative data for a sufficient number of sectors and variables within each sector to demonstrate practical viability will take preference at this stage over the development of full data sets for any one sector.

Where existing data are currently unavailable, proxies from other jurisdictions and prior studies will be applied. Potential future directions for new data generation within Nova Scotia will be noted where major data gaps exist.

While a consulting process is appropriate to this first feasibility stage of the project, it is clearly desirable that further more comprehensive development of the index occur when it is actually adopted by the government as part of a sustainable development strategy, so that the necessary resources for the required data collection from each department would become available.

In sum, the index can be brought into existence by the end of 1999, and be ready in basic form and framework for government adoption at that time. There will be sufficient data in a few sectors for policy application to begin immediately, and also to demonstrate clearly potential future policy relevance in other sectors.

At that stage, the fundamental design process will be complete, so that data gaps can begin to be filled and new data generated to provide desired information for policy purposes. As Statistics Canada continues to develop its own expanded accounts according to established sustainable development criteria, data collection for Nova Scotia should become progressively easier as the new Statistics Canada data become available.

It is believed that, in the event of government adoption by the end of 1999, the index can be fully functioning within five years and become a comprehensive working model for other jurisdictions by that time. The first stage of the modelling process will actually begin later in 1998 when a progress report on the Nova Scotia project will be presented in Ottawa to federal and provincial representatives from throughout the country.

Finally it should be emphasized that the consultants for this process are not in any way devising a 'new' system. Every element of the form, framework and data of the index of sustainable development for Nova Scotia is entirely based on and drawn from prior work by international organizations, national statistics agencies, research institutes and individual experts and economists.

The only innovation of the Nova Scotia index is to *integrate* already existing and proven work from several different areas and to *link* and *connect* disparate and scattered data sets from a variety of sources into a practical comprehensive policy-relevant tool that can actually help guide and implement a working strategy of sustainable development in practice.

In other words, sufficient theoretical and conceptual development has taken place at this stage, so that the current challenge is practical implementation. We feel confident that the Nova Scotia index can make a significant contribution to this process, for the long-term benefit of this province and the country as a whole, and we welcome Statistics Canada's recognition of this potential by designating the Nova Scotia initiative as a "pilot project" for this purpose.

II PROGRESS TO DATE

The first phase of this project has been successfully accomplished with completion of the following tasks:

1. Review of Literature and Applications (see attached Bibliography)

The first major stage of an extensive literature review of existing methodologies, applications, techniques and approaches of key socioeconomic indicator studies, natural resource accounting methods, and composite indices of economic progress linking social, environmental and economic factors has been completed.

In this phase, the emphasis has been on natural resource accounting methods, since natural capital assets form the single largest component of sustainable development indices. There has also been a focus on basic indicator selection criteria and on the general methodologies of composite indices linking social, economic and environmental indicators. Samples of literature relevant to the measurement of sustainable development are included in the bibliography.

In Phase Two there will be an ongoing review of literature relevant to the particular topics in each task described in Chapter III (2) below. These will necessarily have a narrower and more specific focus than many of the references for phase one of the project. Samples of these task-oriented references are given in the bibliography for crime and justice, unpaid work, transportation, and forestry.

2 Strategic partnerships and working relationships

This project is not intended as an academic exercise or modelling study, but is designed to provide policy makers with a practical tool for informed decision-making. (See chapter IV: Policy Relevance) A properly constructed index of sustainable development provides much needed information in a straightforward, accessible way that enables policy makers to link economic, social and environmental factors in making long-term strategic decisions to ensure the prosperity and well-being of future generations of Nova Scotians.

As such, it is crucial, from the beginning, to build an "overlapping consensus" both among government officials and among the widest possible range of stakeholders on the values, indicators and methodologies embodied in the index. John Rawls (1987) has pointed out that any successful conceptual approach must be built on the common insights of many stakeholders, a principle affirmed in the August 1993 initiative of the Canadian Round Tables, "Building Consensus for a Sustainable Future." Rawls notes that public policy based on an "overlapping consensus" affirmed by different theoretical, philosophical, religious and moral doctrines is likely to be both just and resilient and to thrive over generations (Hodge, 1996).

Therefore it is not simply a matter of presenting a final product which is the exclusive work of a small group of researchers. Instead, it is vital during the process itself to consult with and solicit input and feedback from policy planners both so that there is broad agreement and understanding on the principles of the index, and so that the indicators and methods themselves reflect the insights and needs of those who will use the product.

Moreover, this project should contribute to and strengthen policy initiatives already under way, such as the outcomes and performance measurements coordinated by the Priorities

and Planning Secretariat as part of the *Government by Design*, and the Sustainable Development Strategy of the Nova Scotia Round Table.

Furthermore any composite index linking economic, social and environmental variables will require a multidisciplinary approach based on cooperative working relationships among researchers, departmental data analysts and experts, academics and statisticians. The index is designed to integrate a broad range of information in many fields, and so necessitates data input and expertise from many different sources.

For this reason, forging strategic partnerships and cooperative working relationships at every stage is as crucial a part of the project objectives as the research required to assemble the data. Just as it took many years for the GDP to be widely accepted, it is clear that the introduction of an index of sustainable development is a long-term undertaking. Rather than producing a fixed final formula, the indicators and methodologies of the index will undergo continuous modification, refinement and improvement as better methods of valuation and sources of data become available.

The following partnerships and working relationships, forged during phase one, have established the project on a firm foundation that will ensure constructive progress during the next phase:

a) Statistics Canada

The Nova Scotia initiative coincides with considerable interest by Statistics Canada in extending its accounts and exploring linkages between economic, social and environmental data. Thus, work is already under way in Ottawa to expand the national wealth accounts to include cultural and heritage capital and to include the valuation of natural capital in the national balance sheets.

Ranked the leading statistical agency in the world, Statistics Canada also has a reputation for being on the leading edge of new developments in data collection and analysis. The just released Statistics Canada Econnections: Indicators and Detailed Statistics (CAT 16-200-XKE, issued December 4, 1997), which forms the statistical basis for the new Canadian System of Environmental and Resource Accounts, demonstrates the agency's deep interest in measuring economic-environmental interactions. The new system is a major step forward in detailing these linkages and will undoubtedly become a model for international and national statistical agencies world-wide. Needless to say, the work will be an invaluable source of information for our Nova Scotia study.

For these reasons, Statistics Canada has shown great interest in our efforts to develop an index of sustainable development for Nova Scotia. In November, 1997, the Assistant Chief Statistician therefore determined that our Nova Scotia study would be a "pilot project" for the rest of the country and receive in-kind research assistance from the agency at both the federal and regional levels.

Hans Messinger, assistant director for interprovincial trade and socioeconomic indicators in Statistics Canada's Input-Output Division, has been requested by the Assistant Chief Statistician to examine the applicability of the GPI to Canada, to develop new indicators of progress for Canada and the regions, and to assist with the Nova Scotia pilot study. Mr. Messinger has already made two three-day visits to Halifax for extensive consultations and to advise the Nova Scotia GPI project on methodologies and data sources. He will return in late February to lead an inter-departmental consultation for Nova Scotia government policy planners on the development of the index.

Other Statistics Canada officials, researchers and managers in both Ottawa and the Atlantic region are providing invaluable assistance. In Halifax, Statistics Canada has appointed one staff person, Mr. Seth Nanayakura, to assist with data collection for the project. Mr Andrew Maw, who heads the agency's regional office, has kindly provided office space and computer and other facilities for this purpose.

Since much of the Statistics Canada data is currently published only for the country as a whole, the Ottawa office has already provided crucial assistance in reconstructing Nova Scotia provincial figures from the micro-data. Although this is often a time-consuming process that requires going back to the original raw material for its published studies, the agency has offered to continue helping to extract the Nova Scotia material in this way.

In short, we now have a friendly and constructive working relationship with Statistics Canada that will help to ensure the success of the project and the reliability of the data, and will strengthen the methodologies through ongoing consultations and advice.

Statistics Canada plans to host an inter-provincial conference in Ottawa later in 1998, where a progress report on the Nova Scotia index of sustainable development will be presented to both federal and provincial representatives from throughout the country. The agency has recognized the potential application of the Nova Scotia project both at the federal level and in other provinces, and the proposed conference will be the first step in that process.

b) Provincial and Federal Civil Servants

In recent months the project has been presented to and discussed with key policy planners and analysts in provincial and federal government departments and agencies. Several meetings have been held with officials in the departments of Economic Development and Tourism, Environment, and Finance, in the Priorities and Planning Secretariat, in Voluntary Planning and in the Atlantic Canada Opportunities Agency. There have also been discussions with the Atlantic region representative of the Bank of Canada and with private sector interests, including the Chamber of Commerce liaison with the Finance Department.

In phase two of the project, these discussions will be expanded both within provincial and federal departments and will gradually include more representatives from the private sector and non-governmental organizations. A presentation to the Chamber of Commerce has already been proposed.

As each phase two task, outlined in chapter III (2), progresses, draft discussion papers will be presented to key departmental officials to solicit input and feedback to be incorporated in the final version of each set of indicators. Thus, for example, the transportation cost analysis will be discussed with officials within the department of Transportation and Public Works to ensure that their expertise and understanding is reflected in the completed index. Similarly the Nova Scotia forestry accounts will be discussed with both Forestry Canada and the Nova Scotia Natural Resources Department as work proceeds, fisheries accounts with DFO and Nova Scotia Fisheries, and so on.

In sum, rather than presenting a final product *to* the government, the index of sustainable development will already be the work of many government officials who have actively participated in the process. This may take considerably longer than a straightforward academic research project, but will ensure the policy relevance of the index itself and substantially increase the potential for rapid incorporation of the new information into policy planning initiatives.

Because of the potential for constructive coordination with the outcome measurements initiative, the Priorities and Planning Secretariat has offered to issue invitations to the executive directors of policy and key analysts and planners in each department for the inter-departmental consultation scheduled for March, 1998 (see #4 below for details).

Many requests for presentations on the Nova Scotia GPI project have been received. In order to promote understanding of its basic principles and purpose, presentations have so far been made to the Voluntary Planning taxation committee, to the Nova Scotia Department of Environment, to the faculty and students of the Coady International Institute and to the Saint Francis Xavier University community, and most recently to A.C.O.A. economists and staff. We have also accepted invitations for presentations in the new year to the Canadian Economics Association and to the Centre for the Study of Living Standards.

A brief on the project was presented and circulated to the last meeting of the Nova Scotia Round Table on the Environment and Economy in November 1997. In fact the Round Table's 1992 Strategy for Sustainable Development explicitly called for the development of full cost accounting methods and the incorporation of environmental data into the economic accounts. A new membership is in the process of being selected by the Premier, and this will be a potentially very fruitful partnership in phase two of the project, because the Round Table's purpose and mandate is so closely aligned with the goals of a sustainable development index.

c) Leading Researchers, Academics and Experts

In recent months the project has received outstanding advice and assistance from experts in many disciplines. Dr. Andrew Harvey of the Economics Department at Saint Mary's University, a pioneer for more than 25 years in designing Statistics Canada's time use surveys, and who now advises the United Nations, the European Union and many countries in producing these surveys, has provided invaluable assistance in valuing the unpaid work sector, both in answering countless questions and providing excellent sources and data from his own studies. Dr. Lars Osberg of Dalhousie University's Economics Department has given excellent advice on distinguishing stocks and flows in natural resource and environmental accounting.

Dr. Bill Freedman, of Dalhousie's Biology Department, author of widely used texts on Environmental Ecology, was instrumental in helping create Environment Canada's indicator and monitoring program and in laying the groundwork for state of the environment reporting. He has been very helpful in examining methods for determining sustainability thresholds for natural resources and ecological services, and in providing calculations on the ratio between natural carbon emissions and absorption capacity, which are the basis for the index's carbon accounts.

Dr. Scott Wood, director of Dalhousie's School for Resource and Environmental Studies (SRES) and an ecological economist by training, has provided sources on economic accounting of environmental indicators, as well as a broad range of contacts, data sources and expert assistance with methodological questions. Several consultations have already been held with Dr. Wood and he has formally agreed to be on the Advisory Council for the project.

Dr. Torgny Vigerstad (Biology), honorary adjunct professor at SRES, Dalhousie, research associate at the University of Moncton, and president of Bio-Response Systems,

a science-based environmental consulting firm in Halifax, has also given invaluable advice, provided materials, and agreed to serve on the Advisory Council.

Dr. Martin Willison of SRES, Dr. Peter Burton of Development Economics at Dalhousie, Dr. Colin Howell and Dr. John Reid of Saint Mary's Atlantic Canada Studies program, and several other faculty members from both these universities as well as from the development economics program at the Coady International Institute at St. Francis Xavier University have been consulted, have given advice or have offered to read and advise on draft sections of the index as it progresses. Mr Paul Fenton, Atlantic region director of the Bank of Canada, has also agreed to review progress work on the Nova Scotia index and to provide feedback from the perspective of the private sector.

Outside Nova Scotia, there have also been many outstanding researchers and pioneers in sustainable development accounting who have already advised the project, sent materials and provided excellent sources of information.

In particular, Mark Anielski of the Alberta Treasury has done some of the most advanced work in Canada to date in the field of natural resource accounting. For several years, Mr. Anielski has compiled timber accounts for Alberta's forests and developed a Timber Sustainability Index (TSI) for the province. He has also developed carbon accounts for Alberta's forests and presented papers on natural resource accounting to international conferences. We have been in continuous contact with Mr. Anielski who has provided us with outstanding materials, data sources and advice, and patiently answered countless questions on forestry accounting methods.

Tony Hodge, of the University of Victoria, chaired the Prime Minister's National Round Table Task Force Report on Sustainable Development, has written many seminal papers on sustainability accounting and developed the framework and methodology for Progress B.C., British Columbia's indicator project on sustainable development. Mr. Hodge has also sent us excellent materials, provided data sources, and continues to remain in touch with our project as an advisor.

Mr. Bill Pearce of the Regional Municipality of Hamilton-Wentworth's Sustainable Community Indicator Project, Ms. Ann Fitzpatrick of the Edmonton Social Planning Council's "Edmonton Life" indicator project, Ms Ann Kerr, who heads Environment Canada's Indicator Branch in Ottawa, and many others, have provided us with very extensive materials and references that have helped create the provisional framework and methodology for the Nova Scotia index.

Researchers from the International Institute for Sustainable Development in Winnipeg, the World Resources Institute in Washington D.C. and the International Society for Ecological Economics have been consulted and provided helpful advice on natural resource accounting.

Todd Litman, director of the Victoria Transport Policy Institute in B.C., has answered many questions on assessing indirect transportation costs and provided both the Institute's extensive 1997 Transportation Cost Analysis and Transportation Cost Analyzer software, that is probably the most comprehensive accounting system on this subject that exists.

In addition, Clifford Cobb, principle architect of the original Genuine Progress Index in the United States, and the researchers of Redefining Progress, the associated research institute in Sacramento, California, have answered many of our questions on methodology and have explored with us methods of improving on the original methods of valuation.

We have also consulted with researchers from Dalhousie's North American Policy Group who did the Atlantic Canada indicators study based on the World Competitiveness Report, with researchers from the Sustainable Seattle study, with two economists from the Canadian Policy Research Network in Ottawa, and with several other experts in different areas.

In sum, an informal network of provincial and federal government officials and policy planners, statisticians, researchers, academics, experts and consultants has emerged as a de facto **Advisory Council** for the Nova Scotia sustainable development index. The ground has been laid for such a council to assist in the completion of phase two of the project through continued consultations, advice and reference to other experts. The network of advisors will in effect continue to expand through the process of input and feedback from different departments as the sectoral accounts are developed in phase two.

3. Framework, Indicator Selection, Methodology

From the literature review (see #1 above and bibliography), we have extracted some of the most useful, appropriate and widely agreed upon accounting practices and methods relevant to sustainable development that have been developed and applied to date. This has involved a three-stage process:

a) the establishment of a basic framework for the study;
b) the selection and prioritization of indicators; and
c) the determination of appropriate valuation and measurement methodologies for each of the indicators.

This first two steps of this process will be presented to the inter-departmental consultation scheduled for March, 1998, (#5 below) for input and feedback. The provisional framework and indicator selection may be modified at that time.

The third step, since it requires more specialized knowledge, will be refined in phase two of the project during separate consultations with the particular government departments responsible for each of the indicators and tasks described in chapter III (2) below. For example, the transportation cost analysis will be discussed with the Department of Transportation and Public Works, the measurement of costs and services of consumer durables with Finance, the forestry accounts with Natural Resources and Forestry Canada, the soil accounts with Agriculture and Marketing, the fisheries model with DFO and NS Fisheries, the pollution cost analysis with Environment, the costs of crime with Justice and so on.

The following formulation of this three-part process is therefore provisional and subject to change during the consultations of the next year. As described in section 2 of this chapter, above, it is a primary concern of the project that consensus be built at each stage of the development of the index.

A) Basic Framework

Every index or set of indicators is designed to measure progress towards defined goals or values. As Tony Hodge, former chair of the National Round Table Task Force Report on Sustainable Development, has pointed out in his paper, "A

Systemic Approach to Assessing Progress toward Sustainability", every indicator framework is therefore normative by definition, and the operating value base should consequently be explicitly described (Hodge, 1996, p.269).

Since the GDP measures increases in production and consumption, its value base is *quantitative* growth. Indices of sustainability, by contrast, are based on "development" as a *qualitative* concept, which may or may not include growth according to circumstances. Former World Bank economist Herman Daly has described the distinction in this way:

> ***Growth*** *refers to the quantitative increase in the scale of the physical dimension of the economy, the rate of flow of matter and energy through the economy, and the stock of human bodies and artifacts, while* ***development*** *refers to the qualitative improvement in the structure, design, and composition of physical stocks and flows, that result from greater knowledge, both of technique and of purpose.*
> (in Jansson, ed., Investing in Natural Capital, 1994, p.7)

Even the principle architect of the GDP, Simon Kuznets, recognized the flaws of interpreting an index of quantitative growth as a measure of well-being and prosperity:

> *The welfare of a nation can scarcely be inferred from a measurement of national income as defined (by the GDP)....Goals for 'more' growth should specify of what and for what.*
> Simon Kuznets, in The New Republic, October 20, 1962

The concept of "sustainability" adds another two-fold value dimension to this understanding. First, development in the human economy must occur within the carrying capacity of its natural resource base and the ecosystem functions on which it depends.

Secondly, the Hicksian definition of income as the maximum amount that can be spent on consumption in one period without reducing real consumption expenditure in future periods, essentially requires that the productive capacity of capital be maintained so that it provides undiminished potential to support present and future generations. In other words, a measure of prosperity is our ability to live off the interest of capital rather than by depleting capital stocks.

These definitions constitute the fundamental value base of an index of sustainable development. It is important to understand that economic growth is qualified by circumstance rather than excluded by definition.

To take an extreme case for the purposes of illustration, food consumption below accepted WHO guidelines for minimum nutrition and health is unsustainable, because it entails diminished capacity for productive labour and welfare in this generation and potential damage to future generations by nutrient impairment of reproductive functions. In such a case, *quantitative* increases in consumption ("growth") are clearly necessary for *qualitative* improvements in structure ("development"). Similarly, if poverty leads to the farming of marginal lands subject to erosion, economic growth may be necessary to prevent qualitative environmental degradation.

Conversely, the depletion of fish stocks and the accumulation of foreign debt to finance current domestic consumption are unsustainable, because they undermine future prosperity and debit succeeding generations. In such cases qualitative developmental improvements may require certain limits to growth in the form of production cuts (fishing quotas) or reductions in consumption expenditures.

The GDP may have been an appropriate index for a time when resources were seen as unlimited and when quantitative growth and increased consumption were regarded as synonymous with improved quality of life. But our knowledge base is different today, and the shift in values is reflected in how we measure our progress.

Instead of a paradigm of limitless linear growth, sustainable development indices attempt to determine optimum targets and standards and sustainable yield thresholds against which both over-consumption and under-consumption can be measured. In some ways such indices are a return to the original meaning of "economy", with its inherent acceptance of limitations and its natural affinity with conservation and efficiency.

Rather than standing in opposition to environmental concerns, "economy" actually shares the same Greek root ('oikos') as "ecology". There is nothing in the definition of "economy" that implies the possibility of unlimited growth. Webster's dictionary defines the term as:

> *1. avoidance of or freedom from waste in expenditure or management; thrift. 2. a system of management of resources, esp. pecuniary.*

In sum, the normative framework of an index of sustainable development must be explicitly acknowledged, just as any index must clarify the goals and values against which progress is measured. Unless this is clear from the start, it may be thought that the GPI simply measures "more" variables than the GDP. But the new indices are not simply a way of cumulatively "adding" social and environmental factors. The real goal is to *integrate* social, economic and environmental realities to demonstrate their interdependence. These linkages actually set boundaries to quantitative growth.

B) Values and Indicator Selection

Having specified the basic **framework** of a sustainable development index and its distinction from the GDP, the next step has been to translate these normative values into concrete goals on which Nova Scotians can agree.

Once again, it must be emphasized that our conclusions at the end of phase one are provisional and dependent on gradually building a consensus on the goals and values against which progress is to be measured. If the index itself is to contribute to the actual infrastructure of the new economy, and if, as its name suggests, it is to be a measure of "*genuine*" progress, then it must genuinely reflect the views of Nova Scotians.

The framework and the values we are presenting at this early stage are therefore dynamic and flexible, subject to discussion and modification at each stage of the process. Again, this is a primary purpose of the inter-departmental consultation scheduled for March 1998.

From the literature review we have provisionally extracted those sets of values and goals on which we feel the broadest possible non-partisan agreement is likely. These represent literally the social, economic and environmental values against which we are trying to measure sustainable development in our province. They are:

(i) Security

From a review of many indicator studies and quality of life surveys, we have divided the fundamental human need for security into three parts. Although security is ultimately a subjective non-market value, a few examples are given to illustrate how the measurement of "objective" factors can approximate an assessment of progress towards or away from this goal.

a) Physical Safety.

An extensive national opinion survey in British cities by a research team from the University of Glasgow found that low crime rates were the most often cited highest priority for the largest number of respondents in determining what elements were most important to their quality of life. In fact, concern with crime, both violent and nonviolent far outweighed standard economic considerations like "employment prospects" and "wage levels", which ranked 11th and 12th out of 20 variables (Rogerson et.al., 1988, "Indicators of Quality of Life").

A measurement of "genuine progress" then would regard a drop in crime rates as a measure of sustainable development, leading to a qualitative improvement in the quality of life. Linking that to the economic accounts, we consider crime a cost, with increased expenditures bringing the index down, and reduced costs as a result of lower crime rates raising the index, since funds are freed for more constructive purposes that contribute directly to social welfare.

At $42,000 a year, it costs considerably more to keep an inmate in jail for a year than to provide him with a first class university education. By contrast, building prisons and other costs of crime contribute to the GDP and register as economic "growth". It is estimated that the O.J. Simpson trial alone contributed $200 million to the U.S. GDP, and the Oklahoma City bombing considerably more since it produced a boom in the security surveillance and alarm industries. Thus crime costs register quite differently on a qualitative scale than on a strictly quantitative one.

There are clearly other aspects to "physical safety". The cost of automobile accidents, for example, was measured as a separate indicator in the original GPI compiled by Cobb, Halstead and Rowe. In the Nova Scotia index we are proposing that auto accidents be counted as part of a broader category —the costs of transportation.

b) Health

A second aspect of "security" is bodily and mental health. Clearly sickness undermines the sense of well-being and security. For this category we are attempting to align the index with the outcome measures currently used in the *Government by Design* plan of the Nova Scotia government. Many quality of life indicator studies use input measures like government expenditures to assess the state of the health care system. But a truer measure of well-being is whether our population is actually becoming healthier or sicker as measured by numbers of sick days, rates of cancer, heart disease and respiratory illness, perinatal mortality rates, and so on.

In assessing health costs, particular care must be taken to distinguish preventive health care expenses, which are regarded in the index as a positive investment in human capital likely to yield future dividends in increased well-being, from "damage" costs associated with actual sickness. How to make this distinction will be a subject for discussion at the March consultation.

c) Livelihood Security

Income level is clearly one major aspect of livelihood security, but it is not the only one. Shifts between full and part-time work, gain or loss of fringe benefits, length of job tenure and other factors contribute to or detract from the sense of livelihood security.

Other more indirect measures are underemployment and the percentage of young people finding jobs in their field. A wage earner working longer hours to make ends meet may increase his income without feeling an increase in job security. Again we shall solicit input to determine what factors to measure in assessing progress. Costing methods for this indicator are complex.

ii) Equity

Equity considerations lie at the very heart of a sustainable development approach to progress. Introducing the new Canadian System of Environmental and Resource Accounts, Statistics Canada notes that "a consensus has emerged that sustainable development refers at once to economic, social and environmental needs:

> *A clear social objective that falls out of the definition (of sustainable development) is that of equity, both among members of the present generation and between the present and future generations....it is clear that the spirit of sustainable development implies that all people have the right to a healthy, productive environment and the economic and social benefits that come with it.* (Cat. no. 16-515-GPE, p.10)

There are three forms of equity of particular relevance to the Nova Scotia index of sustainable development:

a) Inter-generational Equity

Concern that future generations have equal or greater access to the sources of prosperity is central to the very definition of sustainability and of Hicksian income. Excess depletion of natural resources or a decline in ecological services (such as soil productivity) resulting from environmental degradation can undermine sustainability and threaten future prosperity. Conversely, investment in natural capital, such as the restoration of a

degraded environment, represents a current sacrifice that will likely increase future well-being.

Although environmental factors are measured separately in (iii) below, the concern here is whether succeeding generations are better or worse off than the present one. The issue is pertinent in light of Nobel laureate economist Robert Solow's observation that this generation may be the first in North American history that will leave its children poorer than itself.

Inter-generational equity and economic sustainability are also affected by trends in net foreign lending or borrowing. If foreign funding is used to finance current consumption, temporary wealth in one generation can turn into indebtedness in the next when loan repayments come due. A failure to reduce debt can further produce a loss in investor confidence and a drop in currency values.

In this measurement, it is important to distinguish the use of foreign funding for investment purposes, which can contribute to future prosperity, from that portion used to finance consumption. Only the latter is subtracted from the GPI and balanced against any movement in the direction of net foreign lending which can increase capital assets in the future.

b) Intra-generational Equity

Sustainable development approaches shift the emphasis from increases in production to distributional issues in a reality of limited resources and carrying capacity. This view naturally brings intra-generational equity issues to the forefront. As noted earlier, absolute and average per capita GDP can increase even as a significant portion of the population is getting poorer. Thus, a qualitative assessment of progress should determine the extent to which increases in prosperity benefit the population as a whole. The GPI adjusts increases in consumption according to changes in income distribution.

c) Geographical Equity

For the Atlantic region, as for the developing nations, regional equity issues are also paramount, since increased inequity and dependence on stronger financial centres outside the region could signal a decline in regional sustainability and self-reliance, and a vulnerability to external shocks. Furthermore, as William Rees and Mathis Wackernagel of the University of British Columbia have pointed out, it is possible for one region to "appropriate carrying capacity" from another. Thus resource depletion in one area may show up as an increase in wealth in another.

Measurements of financial and human capital movements, research and development funds, venture capital availability and the degree of local inputs into new investments and resultant spin-off benefits, can assess growing or declining regional equity and self-reliance. Trends in migration of skilled and educated workers, and the degree of pension fund reinvestment in the region are of concern to Atlantic Canada.

d) The Equity Test

In evaluating criteria for indicator selection, Maureen Hart proposes that any indicator which registers a gain in well-being for one community as a corresponding loss for another should automatically be disqualified from consideration. In a sense this requirement to demonstrate 'net' overall benefit applies the equity test to all indicators.

Thus, for example, a decline in crime or sickness produces a net gain in well-being without corresponding loss elsewhere.

But net international lending or borrowing status as described above might be a more dubious variable from Hart's perspective if foreign lending for consumption abroad produced a positive gain in the home index against a declining index abroad. On the other hand, lending or borrowing for investment purposes is likely to produce net overall benefit, while lending for consumption could produce an overall decline if the borrower does not also increase the assets necessary to repay the loan. Borrower default causes losses on both sides. In other words, excess consumption and insufficient investment is the issue rather than the net international lending or borrowing situation.

(iii) Environmental Quality —Investing in Natural Capital

In one sense, this value is a component of the first one – security. Clearly human security is undermined if the life support functions of the encompassing ecosystem are compromised, and enhanced to the degree that the human economy invests in natural capital. It is considered separately here, however, because all three aspects of security described above pertain primarily to the human social and economic sub-system. The value introduced here is care for the larger ecosystem on whose services we depend for survival.

This goal necessitates a bigger view, and recognizes that interactions between the human economy and the ecosystem are more indirect and harder to trace than interactions within the human sub-system. Economic - ecological interactions may be cumulative rather than linear, producing sudden changes when critical thresholds are crossed; there may be multiple causes for one effect and a single factor (e.g. CFC's) may produce multiple impacts; there may be long time lags before impacts are felt; and there may be synergistic interactions accentuating or ameliorating the effects of single causes.

Dr. Bill Freedman of Dalhousie's Biology Department, a pioneer in Environment Canada's monitoring and indicator development work, has argued that environmental quality can be considered an inherent or intrinsic value, aside from its impact on the human economy. On the other hand an index that incorporates benefit cost analysis and assigns monetary values must attempt to trace economic - ecological interactions, even if only for policy purposes. Thus, soil erosion may be an intrinsic loss from the perspective of environmental quality. But a costing analysis will attempt to trace the economic impacts of a decline in soil productivity on crop production.

The International Society for Ecological Economics has proposed that the value of environmental quality be viewed as "investing in natural capital". In developing the framework for the Nova Scotia sustainable development index, we have found this designation very useful in framing the issue in economic terms and facilitating a comparison with depreciation methods applied to other capital assets.

The conceptual framework for the analysis of environmental quality, therefore, is the notion that ecosystem functions provide "ecological services" to the human economy, just as plant, equipment and infrastructure provide essential services in the production of commodities. A natural resource like a forest provides not only timber, but also protection of watershed and soil quality, air purification and climate regulation, carbon fixation, recreation and aesthetic enjoyment. Other non-market environmental resources provide services like waste assimilation, nutrient and hydrologic cycles, pollination and photosynthesis, which are essential to human survival.

From this perspective, environmental protection is seen from an economic point of view as capital investment designed to ensure the continuation of a high quality of essential services, and environmental degradation or resource depletion is seen as capital depreciation which may potentially disrupt the continued provision of such services. As Statistics Canada notes, "the flow of these (environmental) services (and amenities) is analogous to the flow of services provided by produced capital goods" (Cat.16-505-GPE, p.11).

Environmental quality or investing in natural capital has three major components, corresponding to ecosystem *inputs* into the economy, economic *outputs* back into the environment, and the combined impact of production and consumption patterns on the carrying capacity of the ecosystem. This classification corresponds to (a) natural resource use, (b) environmental conservation and degradation, including pollution and waste generation, and (c) ecological footprint analysis.

As far as possible, to ensure comparability and conformity with emerging national and international standards, Statistics Canada's new Canadian System for Environmental and Resource Accounts (CSERA), will serve as the basis for this three-fold analysis. Thus, (a) above will use the new Natural Resource Stock Accounts (NRSA) as a foundation, with additional data provided on fisheries and soils, which are not yet part of the NRSA but are of major importance for Nova Scotia. Both the Environmental Protection Expenditure Accounts (EPEA) and the Material and Energy Flow Accounts (MEFA) will provide the framework and substantial data input for (b) above. And the ecological footprint analysis for Nova Scotia (c) will be based on the MEFA, with additional information on resource flows from agricultural land. It should also be noted that the NRSA and EPEA can more readily be adapted to provincial use at the present time, while the MEFA are currently organized on a national basis only.

The caveats are necessary because Statistics Canada acknowledges that "the CSERA remains a work-in-progress that will continue to develop with time," and presently "represents only a portion of what a complete set of environmental and resource accounts for Canada would cover." Indeed, for the Material and Energy Flow Accounts (MEFA), the "current state of empirical development represents only a small fraction of the material and energy flows that would be ideally covered" (ibid., pp.v and 13). It is our hope that the Nova Scotia pilot study will make a positive contribution to the development of the CSERA for Canada as a whole.

In addition, transportation costs are considered separately in the Nova Scotia study, both because the environmental impacts fall into all three categories cited above, and because transportation includes 'non-environmental' benefits and costs like the services of roads and highways and the costs of automobile accidents.

For all natural capital factors it is necessary to develop both stock accounts and flow accounts, the latter representing trends towards investment or depreciation, and the former measuring cumulative impacts over time. We are indebted to Dr. Lars Osberg of Dalhousie's Economics Department for this important observation and for his critique of the original U.S. GPI for failing to make this distinction. The CSERA does make the distinction clear by tying the NRSA to the national balance sheets and overall "wealth" assessments, and the MEFA to the Input-Output Accounts. Since this has the additional advantage of linking the environmental accounts directly to the existing economic accounting framework, the new CSERA is also a suitable conceptual framework for the Nova Scotia study.

(a) Natural Resource Accounts

Although the original GPI measured only depletion of non-renewable resources, Hans Messinger of Statistics Canada has rightly recommended that the Nova Scotia GPI include the consideration of renewable resources. To the extent that it is possible, both market and non-market values will be taken into account. Forests, fisheries, soils, wetlands and non-renewable resources are considered in the index. Statistics Canada's Econnections (Cat. 16-200-XKE), which includes valuations of Canada's natural resource wealth for subsoil assets, timber and land, will be one invaluable source for this section.

For the purposes of this index we have accepted the virtual consensus of the ecological economics profession on the fundamental 'non-substitutability' of natural and produced capital. It has been argued that technological change and improvements in efficiency may enable man-made capital to provide partial substitutes for some market functions of natural capital, thereby allowing for a depletion of natural resources without undue impacts on prosperity. That view is described in the literature as "weak sustainability".

But ecological economists have argued that renewable natural capital assets provide a large variety of interdependent ecological services, aside from direct market functions, and that there is a basic uni-directional flow from the encompassing ecosystem to the *dependent* human subsystem. Both realities fundamentally invalidate the assumption of substitutability in the long-term, even if resource depletion causes no apparent loss of prosperity in the short run. This view of "strong sustainability" on which the Nova Scotia study is based, "requires that stocks of natural and produced capital be maintained intact independent of one another" and assumes "that the two forms of capital are mainly complementary" (Statistics Canada, Cat.16-505-GPE, pp.11, 12).

From the literature review, it appears that there is broad professional agreement that the assumption of substitutability be confined to non-renewable resources, since there is no possible way of maintaining natural capital stocks of oil, coal, natural gas and minerals and every use of these resources would appear in the accounts as an absolute decline in stocks and loss of prosperity. In this case non-renewable resource depletion is not counted as a cost in the index to the extent that there is compensatory investment in renewable energy sources that can offset the loss in the future.

b) Environmental Conservation and Degradation

The standard classification here, recently applied in the Progress B.C. indicator study, is to consider air, water and terrestrial systems, each of which are again divided into separate indicator sets. For the Nova Scotia study, atmospheric emissions from the human economy include four measures: --standard ambient air quality measures of pollution, the costs of acid rain deposition, and the long-term impacts of climate change and stratospheric ozone depletion. Water quality is considered for three broad areas —surface waters, ground water, and the marine environment. Terrestrial impacts are considered for three factors — sustainable resource use, the preservation of biological diversity, including protected areas, and solid waste generation, including both municipal and hazardous wastes.

In Statistics Canada's new expanded economic accounts, defensive expenditures guarding against environmental deterioration in the EPEA should eventually show up as "investment in natural capital" which would be reflected in changes in the MEFA. For example, improvements in emission controls, designations of protected areas, and strategies for waste reduction, reuse and recycling, would eventually produce reductions in waste flows and more sustainable resource use. "Although this relationship exists in

theory, no attempt has yet been made to quantify it by explicitly linking these two accounts", according to Statistics Canada, but the integration of the accounts is planned as a high priority future development of the CSERA (Cat. 16-505-GPE, pp.109, 121).

This linkage is in keeping with the investment-oriented approach of the Nova Scotia study as well, since a current income sacrifice for the sake of investment is expected to yield improved benefits and services in the future. Thus, in constructing a composite index like the GPI, "defensive expenditures" are initially deducted since "environmental protection expenditures represent outlays that yield no immediate economic benefits" and are effectively "society's response to the negative environmental effects of economic activity" (Statistics Canada Cat.16-505-GPE). However the longer term benefits that flow from these investments will eventually cause the index to rise, and register a gain in well-being.

An unresolved question is the degree to which such investments correspond to subjective quality of life assessments. In the British national opinion survey mentioned above, environmental quality issues ranked second in importance after crime for most respondents. Because the Nova Scotia index uses monetary values, no attempt is made to weight values according to subjective priority assessments, as the University of Glasgow study did. Nevertheless, from a policy perspective, an accurate index of sustainable development measuring qualitative improvements in well-being and prosperity cannot be completely out of synchrony with subjective perceptions.

The relation between objective and subjective criteria is discussed extensively in the quality of life literature, and should definitely be raised at the inter-departmental consultation in March, particularly as it affects valuations of environmental quality. "Contingent valuation" (CV) analysis, assessing the public's willingness to pay (WTP) or to accept compensation (WTA) for a gain or loss of benefits, attempts to bridge the gap, but it is still a highly controversial method and must be used with great care in assessing monetary valuations of non-market values. The Asian Development Bank's recent workbook on Economic Evaluation of Environmental Impacts (1996) does use some WTP and WTA valuations from CV analyses, a few of which will be judiciously applied to the Nova Scotia study but clearly designated as "proxy" values.

c) Ecological Footprint Analysis

This aspect of the accounts is based on the work of William Rees and Mathis Wackernagel at the University of British Columbia and recognizes that the economic - environmental interactions considered above are all basically functions of current production and consumption patterns. In other words, the level and type of production and consumption of a particular society directly determine its levels of natural resource exploitation, pollution, waste generation and other environmental impacts.

Analysis of the "ecological footprint" of production and consumption patterns is therefore not only a useful summation of the variables described in (a) and (b) above, but is also a direct measurement of sustainability, since a ratio is established between the human "footprint" and the carrying capacity of the encompassing ecosystem. Rees and Wackernagel's consideration of "appropriated" carrying capacity also conveniently factors in the effects of trade and therefore includes a measure of geographical equity.

Although not presently organized by province and empirically limited at present to water, energy and greenhouse gas emissions, the new MEFA potentially provide a powerful data source for ecological footprint analysis. Linked as they are to the input-output accounts, the MEFA include data on the embodied resource, energy and potential waste content of

exports and imports, and are thus highly compatible with ecological footprint / appropriated carrying capacity analysis. Current data limitations will require the use of some proxy valuations for the present Nova Scotia study, but the gradual development of the MEFA, including Statistics Canada's long-term plan to regionalize the accounts to the provincial/territorial level (Cat.16-505-GPE, p.96), will provide increasingly accurate direct measurements for ecological footprint analysis in the province.

These three sets of values — security, equity and environmental quality —set the basic parameters of the Nova Scotia index of sustainable development and establish the fundamental goals against which progress is measured.

In the coming months we hope that there will be a continuously expanding discussion on these values and goals to determine the degree to which consensus exists, and to refine our definitions and modify the list of variables to be included in the index. Again it must be emphasized that since the framework for any index of progress is fundamentally normative, this process of consensus building is at least as important as the research and data collection itself. Good information will only be used in policy making to the degree that it corresponds with political priorities and public values.

(iv) Other Human and Social Values

An index of sustainable development necessarily focuses most attention on the underlying necessary conditions for prosperity, and the three sets of values considered above have been selected for that reason. However there are clearly "higher" measures of well-being, corresponding to Aristotle's distinction between the "integral parts" of a social system and its "necessary conditions". In other words, an individual or society may have abundant security, a healthy environment and more than equal opportunities for development, but may still waste this potential and experience no gain in well-being. The reverse may also be true. Against seemingly insuperable odds, individuals occasionally develop their potential to a remarkable degree.

In short, it is necessary to recognize that progress towards the values and goals delineated in a sustainable development index does not in itself measure greater well-being or prosperity, but only expanded opportunity for their realization. In the end, it is still up to each individual and society what *use* they actually make of these opportunities. For this reason we are proposing a briefer "satellite" account assessing the "integral parts" of human development, to accompany the more detailed sustainable development index of "necessary conditions". From the literature review, we have provisionally selected three of these "higher" values against which to measure actual outcomes in well-being.

a) Freedom

This includes openness and tolerance of diversity, actual protection of human rights as defined in the Universal Declaration of Human Rights and the Canadian Charter of Rights and Freedoms, and also positive participation in community decision-making and in political and civic processes. For this factor, which represents an investment in social capital, we intend simply to apply existing measures such as the Human Freedom Index (HFI) to Nova Scotia, which will allow comparability.

b) Knowledge

An examination of relevant literature reveals that education is one of the most complex and difficult variables to measure. From an input perspective, it represents an important investment in human capital. But it is particularly challenging to correlate that investment

with performance measurements. Even standard outcome measures such as the percentage of the population with high school or university degrees provide no information on the quality of education or type and relevance of knowledge attained.

Measures of functional literacy and standardized reading, math and geography tests are better measures of actual performance, but still recognize only very primitive levels of attainment. With the increasing recognition of the critical importance of human capital in a knowledge based economy, better ways of measuring educational attainment will have to be found.

c) Caring Society

Sociologists have remarked that the ultimate measure of a society's progress and attainment is the degree to which it takes care of its most vulnerable and least productive members. The definition can be expanded to include groups beyond a society's borders, as measured, for example, by development assistance to the poorest nations. L Aronson and M. Charles have conducted a literature review of studies on "the social caring capacity of a community" for the University of British Columbia's Task Force on Healthy and Sustainable Communities. In phase two, potential indices of "caring capacity" will be examined more closely.

These six values —security, equity, environmental quality, freedom, knowledge and caring —have been selected both for their relevance to sustainable development as defined above, and for their potential for broad consensus among Nova Scotians. Together they represent a provisional normative framework for a composite genuine progress index for the province.

(v) Indicator Prioritization Process

Because the index will focus primarily on the first three values as "necessary conditions" of development, the indicators of progress towards these goals have been subjected to various tests evaluating their potential effectiveness. They were then prioritized according to the criteria for indicator selection in P. Gosselin, D. Belanger, J.F. Bibeault and A. Webster (1991), Feasibility Study on the Development of Indicators for a Sustainable Society, prepared for Health and Welfare Canada, and in Virginia Maclaren (1996), Developing Indicators of Urban Sustainability: A Focus on the Canadian Experience, prepared for Environment Canada, Canada Mortgage and Housing Corporation, and the Intergovernmental Committee on Urban and Regional Research.

These two studies were used as primary reference points because they include effectiveness in measuring sustainable development goals in particular, in addition to more general selection criteria. Thus Maclaren's sustainability goals include inter-generational equity, intra-generational equity, minimal impact on the natural environment, living off the interest of renewable resources, minimal use of non-renewable resources, diversity and long-term economic development.

Her general selection criteria include scientific validity, representativeness, relevance to the needs of potential users, understandability, basis in accurate and accessible data that are comparable over time, comparability to thresholds and targets, comparability with indicators used in other jurisdictions, lack of ambiguity and cost effectiveness in usage.

In a sample test of potential indicators of sustainability according to these criteria, Maclaren ranked Rees and Wackernagel's "ecological footprint / appropriated carrying capacity" analysis highest among all the indicators examined, meeting 11 out of 16 selection criteria. As a result of our own tests using these criteria and considering particular relevance to Nova Scotia, we have provisionally selected and prioritized 16 indicators for the Nova Scotia index, and identified several more for potential inclusion in the index at a later stage when methodologies and data collection can be more refined.

The indicators selected for phase two (1998) are described in the tasks listed in Chapter III (2) below. As mentioned earlier, it must be emphasized that this selection is provisional and subject to modification during the consultation process. In other words, if there are serious doubts about the relevance or wisdom of including some of the indicators chosen, or identification of other important indicators so far omitted, the tasks

in phase two will be adjusted accordingly, to ensure that the entire process reflects broad agreement among policy makers and stakeholders.

C. Methodology

This third step in constructing a sustainable development index for Nova Scotia is qualitatively different from the first two steps described above. As discussed, broad non-partisan agreement is needed to establish the basic normative framework, values and goals of the index and to select and prioritize the indicators. These two steps create the foundation that determines ***what*** is to be measured and ***why.*** In effect, they constitute the Nova Scotian definition of "progress" which integrates the data into a meaningful whole. The methodology, on the other hand, determines ***how*** the various indicators are to be measured.

The following basic methodological principles are being proposed for this study:

(i) Eclectic Approach

Many studies adopt a standard system and consistent methodology throughout. An example is the Australia Institute's recently completed application of Cobb, Halstead and Rowe's Genuine Progress Index to Australia (October 1997, see bibliography). With very few changes, the authors simply replicated the original GPI and fed in the Australian data.

There are three major reasons we have not adopted this approach:

(a) While the original GPI was based on sound principles, there were some serious methodological flaws which have been ably summarized by Hans Messinger of Statistics Canada (June, 1997, unpublished draft, attached) who himself did a straight replication of the GPI to Canada. There is no reason to repeat these errors when there are clear alternatives and modifications that can considerably improve the methods and make them more accurate.

In fact, discussions with Clifford Cobb, the original architect of the GPI and its predecessor, the Index of Sustainable Economic Welfare, and with the researchers at Redefining Progress, the index's parent research institute, have made clear that the GPI was intended as a basic approach rather than a final system to be rigidly applied. Indeed, the writers have welcomed many changes we have suggested and pointed out that they had deliberately not trademarked the term GPI in the hope that the methodology would be improved, refined and flexibly adapted to the particular needs of different regions.

(b) If the goals and values of the index are clearly specified and based in a broad consensus reflecting the province's vision and sense of direction, and if there is a strong integrating framework adhering to the principles of sustainable development, then there is no need to solidify the way in which the measurements are made.

In the Nova Scotia case, unlike many other applications, the index is being developed with a view to practical policy making and with the participation of a wide range of provincial and federal government officials and policy planners. Flexible adaptation to the needs and requirements of different departments will be more helpful in specifying measuring tools than imposing a standard methodology from outside.

(c) It is in the very nature of methodologies to be incomplete, partial, piece-meal, and subject to constant change. Valuations are always approximations of reality and complete data are rarely available on any subject. "Indicators" are just that —they "indicate" or point to a reality rather than describe it directly. In fact, the values outlined above are not

ultimately capable of quantification at all. Material reality tries to adhere to a social vision or purpose which a monetized index can never fully capture.

In addition there are constant improvements in measuring techniques and data collection. One reason why an index that integrates environmental and economic factors could not have been implemented 15 years ago is that state of the environment reporting itself is relatively new and data were simply not available. The first Atlantic region state of the environment report was issued in 1985, and Statistics Canada's first full Human Activity and the Environment report appeared in 1991. Furthermore, the technology for processing large quantities of data was not available until quite recently.

Therefore, for all the reasons cited above, we have adopted a very eclectic approach, proposing some of the most useful and appropriate methods developed to date by a wide variety of research institutes, governmental agencies, international organizations and individual experts in different fields. We have drawn on studies and applications developed by the U.N. Statistical Office, the OECD, the World Bank, the World Resources Institute and the Asian Development Bank, by Statistics Canada and other national statistical agencies particularly in western Europe, by economists from Europe, the United States, the University of British Columbia, the Alberta Treasury and other governmental and academic institutions, and by several research institutes, think tanks and non-governmental organizations.

Our attitude should be one of complete openness, welcoming new and better methods of valuation and measurement as they become available, as indeed the authors of the original GPI have done. This is also important from the point of view of consensus building discussed above. Anyone with constructive criticism, advice or expertise should feel included in the ongoing design process of the Nova Scotia index.

It is clear from the provisional list of methodologies which we are recommending that we are not inventing anything new or creating any new system, but merely integrating promising valuation methods from many sources. We have favoured those methods that are designed for practical application and policy relevance, and especially that can contribute to the governmental goal of measuring the *outcomes* of policy as well as those that facilitate comparability with other jurisdictions. We have already started to test many of these methods, and all of them will be presented separately to experts and policy planners in the relevant government departments for their input and feedback.

(ii) Sectoral Accounts:
Inclusion of Government Expenditures; and Avoidance of Double Counting in Final Aggregation

The eclectic approach can work particularly well if there is less emphasis on an aggregate bottom line for the index and more attention to a meaningful set of accounts for each issue or sector. The original GPI was particularly concerned to produce a composite index showing an overall trend that contrasted sharply with the GDP. Care was taken to avoid double counting, and almost all government expenditures (with the exception of spending on highways and roads) were excluded on the grounds that they constitute essentially "defensive expenditures" (see (iv) below).

While such sweeping generalizations are less of a problem if the main concern is with an overall aggregate, they do prevent meaningful analysis at the sectoral level. For example, the "cost of crime" in the original GPI includes private expenditures on burglar alarms and security devices, but excludes government expenditures on prisons, police and courts because these have already been excluded from the index as a whole as governmental

defensive expenditures. Clearly the tabulation of those individual expenses (column H in the original GPI) does not really portray the "costs of crime" to society, but simply the contribution of certain expenses to the final composite index.

That approach is not very helpful for policy purposes because there is no comprehensive accounting for each sector as a unit and therefore no guidelines to policy makers concerned to identify the largest expenditures and take meaningful action. For the accounts to be practically useful, for example, justice officials will want to compare inmate incarceration costs and other expenses in Nova Scotia with the rest of the country, and to identify where the best return on investment will likely be in crime prevention strategies. In the Nova Scotia accounts we are therefore including all expenses —government, individual and corporate —for each sector examined. This is in line with the approach taken in the new Canadian System of Environmental and Resource Accounts (CSERA).

In short, it is assumed that our purpose in constructing the Nova Scotia accounts is somewhat different than that of other composite indices. Since policy is still made and implemented by departments, we are more concerned to portray as full a picture as possible of each sector —crime, transportation, forestry, soil, and so on. In that case, an eclectic approach is less problematic than it might be if the main concern were with the overall "bottom line" of the composite index. We have therefore been concerned to find the most appropriate accounting method for each sector. The best method for calculating productivity losses from soil erosion will be different from those appropriate for the forestry accounts or the transportation cost analysis.

A final aggregate "bottom line" will be calculated at the end of the process in order to provide a measure of overall progress towards the basic social goals and values described above, and so that the composite index can function as a fundamental measure of social well-being and prosperity, as the GDP is frequently used today. In that final aggregation, particular care will be taken to avoid double-counting. For example, carbon emission costs may appear at least three times in the sectoral accounts —in the transportation cost analysis, in the calculation of the value of forests as carbon sinks in the forestry accounts, and in the climate change section of the costs of atmospheric emissions. Calculating the final index is therefore more complex than simply summing the aggregate benefits and costs within each sector. But the extra trouble will be worth the benefit of having meaningful sectoral accounts.

(iii) Direct and Indirect Measurements

An index of sustainable development measures many non-market values to which it is difficult to assign monetary values with precision. In addition, we are measuring variables for which data collection has often been sporadic or which has begun so recently that accurate time series cannot be constructed.

In some cases, where data is not available at all for Nova Scotia, it may be necessary to establish proxy values based on studies from other jurisdictions. The Asian Development Bank's workbook on Economic Evaluation of Environmental Impacts, for example, references many such potential proxies, from well-documented market studies to contingent valuation analyses for non-market and non-use values. In the original Genuine Progress Index, it is impossible to tell from the tables themselves which data for which years represent direct measurements and which are extrapolations, although the authors do explain their methodology in the accompanying prose sections.

For these reasons we are proposing the following three-fold distinction in constructing the Nova Scotia index. *Direct* measurements based on existing and available data for a particular year, and for which established and accepted methods of valuation exist, will appear in bold type in the accounts. Data for Nova Scotia taken from Statistics Canada's CSERA, for example, fall in this category. *Indirect* measurements, based on extrapolations and proxies, but for which established and accepted methods of valuation exist, will appear in light normal type face.

Non-market values for which no accepted method of valuation exists will be marked by an algebraic letter to denote that economic impacts do exist, but that the monetary value of such impacts is unknown. In each such case, an accompanying footnote will present a summary of the estimated impacts in prose form, according to the best evidence available at the time.

For example, Statistics Canada's time use surveys and General Social Surveys for household work and the unpaid sector exist for 1961, 1971, 1981, 1986 and 1992. In addition, Statistics Canada has three basic accepted ways of valuing this work, of which the generalist replacement cost method is the most conservative. In this case, values for household work for the five available years will be computed for Nova Scotia and listed in bold type. Values for the intermediate years, for which direct measurements do not exist, will be calculated using a simple log linear regression technique and assuming a constant rate of growth between the measured years. Those values will be appear in the tables in normal type face.

In the forestry accounts, there is no established method for precisely calculating the value of forests in protecting biodiversity. In this case, biodiversity will simply be given an "x" value, and the final "forestry sustainability index" will be expressed as a monetary value with an "x" attached. The accompanying footnote will explain the known economic values of biodiversity, including the production of food and pharmaceuticals, soil and plant productivity, and contributions to the food chain for commercial species.

This formula, while inelegant, is preferable to the tendency of most indices we have examined to omit indicators for which data are not available. In fact "data availability" is generally listed as a primary criterion for indicator selection. The problem is that such exclusion biases the index towards the conventional values for which data have been collected in the past. Emerging critical issues may be overlooked and take longer than necessary to make their way into the accounts.

Excluding non-market values entirely because of methodological and data deficiencies can seriously underprice resource use, for example, and distort results to favour increased production of marketable commodities. The accounts will provide insufficient basis for accurate cost-benefit analysis among a variety of related variables if the least measurable ones are summarily omitted.

By their very nature, values like biodiversity may be impossible to monetize accurately even though the fact of rapid species extinction *is* known scientifically. If accurate monetary valuation is the criterion for inclusion, such values will never be reflected in the accounts. It would be more accurate to recognize the deficiency as a characteristic of the limitations of money per se as a valuation instrument than as a cause for omission from cost-benefit analysis.

Including a measure, even in the form of a letter for unknown values, is more likely to provide the impetus for future data collection and valuation efforts, since needed information is clearly identified. In fact, it should be a primary goal of the index gradually to convert as many of the proxy values to bold type, and as many of the letter denotations to numerical values as possible.

Each succeeding index should contain a larger proportion of bold type face direct measurements and a smaller proportion of letter values. That itself will be a measure of progress towards better and more accurate data collection and valuation methods for critical non-market factors. Such progress, in turn, is a prerequisite and major step towards the "full-cost accounting" methods which are widely recognized as the basis for a sustainable development strategy (Nova Scotia Round Table Strategy for Sustainable Development, 1992).

The Victoria Transportation Policy Institute's Transportation Cost Analysis argues that three parallel processes are necessary to facilitate the transition to full-cost accounting. Fixed, external and non-market costs are more likely to be undervalued than variable, internal, market costs like automobile operating expenses. Calculating the "true" or full cost of driving. therefore, necessitates including fixed costs like parking and vehicle ownership, external market costs like operating subsidies, road facilities and municipal services, and non-market costs like accidents, pollution, resource consumption and land use impacts.

As long as economic behaviour responds to financial incentives and penalties like taxes, prices and subsidies, the practical operationalization of a sustainable development strategy will require internalizing as many external costs as possible, and assigning market proxy valuations for recognized non-market values.

Thus, for example, the Nova Scotia forestry accounts, in accordance with the recommendations and criteria of the Canadian Council of Forestry Ministers, will include proxy valuations of the value of forests in soil and watershed protection, carbon fixation and biodiversity and habitat preservation, as well as the more standard timber accounts that have been developed to date. The three-tiered system described above should ensure that the lack of precision in assigning monetary values to non-market factors is clearly and openly acknowledged.

In sum, omitting key variables because of methodological difficulties confuses content with process, and encourages the continued under-valuation of factors that have already been neglected in the standard historical accounts. The particular approach of the Nova Scotia index, therefore, is to begin constructing the framework for a full-fledged set of

sustainable development accounts, even in the absence of fully developed valuation methods and data sources. Having identified key variables, future research can then fill in data gaps and improve valuation methods.

(iv) Defensive Expenditures

The original GPI subtracts "defensive expenditures" from the accounts on the grounds that they are current compensations for past costs rather than net contributions to economic and social welfare. Statistics Canada defines defensive expenditures as those "undertaken to maintain a given level of welfare or to defend against a decline in welfare. All other expenditures are assumed implicitly to be welfare enhancing."

According to this logic, a genuine index of progress should only rise when net welfare improves. Since the GDP does not make this distinction, economic transactions that merely compensate for environmental degradation or rising crime, for example, misleadingly appear in the accounts as improved welfare even though they are not practically experienced as such. That anomaly prompted the title for the original October 1995 Atlantic Monthly article which presented the GPI -- *"If the GDP is Up, Why is America Down?"*

Nevertheless, operationalizing the concept of "defensive expenditures" and incorporating it into the accounts is very challenging, as a closer examination of more explicit definitions demonstrates. The 1993 United Nations Handbook of National Accounting: Integrated Environmental and Economic Accounts defines "defensive expenditures" in relation to the environment as follows:

> *....The actual environmental protection costs involved in preventing or neutralizing a decrease in environmental quality, as well as the actual expenditures that are necessary to compensate for or repair the negative impacts of an actually deteriorated environment.*

A similar definition of defensive expenditures could be constructed for social costs like crime prevention, legal expenses and divorce costs.

But there is a qualitative difference between prevention on the one hand and damage that has already occurred on the other, a distinction we intend to make in the Nova Scotia index, for example, in assessing health costs. Furthermore, both preventive measures and the costs of restoring a degraded environment could equally be interpreted as productive investments in natural or human capital which will contribute a net future gain in quality of life.

In other words, there is a fundamental ambiguity in determining whether increases in defensive expenditures denote progress towards or away from sustainability. They could signal an increase in environmental commitment and potential quality improvements as the result of the repair of previous damage and the restoration of degraded habitat. Or they might reflect the need to keep pace with growing environmental damage caused by increases in economic activity and population pressures. The original GPI took the latter view, but some studies, like M.L.B. Jerrett's Environmental Assessment of Policy Through Budgetary Analysis (1994), regard defensive expenditures as positive indicators of government response to human activity stressors.

To deal with this dilemma, we propose that the Nova Scotia index use Dr. Lars Osberg's method of distinguishing stocks from flows. Thus, two separate sets of measurements would, in effect, replace the "defensive expenditure" category currently used by the United Nations and the original GPI.

First, the actual costs of damage done are *subtracted* from the index as a decrease in *stock* values, with the cost of restoration efforts serving as a proxy for the depreciation of natural capital. As a second step, however, the same restoration efforts are recognized as positive investment by *adding* the resultant *flow* of improved services that will contribute to future environmental quality. In effect, this treatment of defensive expenditures follows the same two-step logic as the original GPI method of deducting the cost of consumer durables and then adding the value of services over time provided by these durables.

Econnections, the just released Statistics Canada publication on economic - environmental connections (cat.16-200-XKE, Dec.4, 1997), contains one of the best and most detailed accounts of defensive expenditures available. The Environmental Protection Expenditure Accounts (EPEA) contain detailed monetary valuations of government and business attempts to "abate, prevent and control pollution", and future accounts will include household expenditures as well. Environmental protection expenditures in the business sector are those measures designed to comply with Canadian emissions standards and other regulations and conventions.

A future planned direction for the Canadian System of Environmental and Resource Accounts is to link the EPEA with the new Material and Energy Flow Accounts (MEFA). This will allow for a more subtle and accurate incorporation of defensive expenditures into the accounts than the original GPI, since such expenditures will simultaneously be recognized as positive investments in natural capital that will yield net gains in energy efficiency, and reduced waste and resource flows in the future. The proposed two-step process in the Nova Scotia index also follows the logic of this linkage, by deducting the EPEA costs and then adding resultant improvements in MEFA trends.

(v) Incorporating Uncertainty

In any future-oriented or investment-guided approach to economic accounting, there are inherent uncertainties in establishing current valuations based on estimated future benefits and costs, since the future, by definition is unknown. All investment strategies must determine the magnitude of an acceptable current sacrifice (cost), based on estimated but uncertain future returns. These uncertainties are magnified in our accounts both by the complexity of economic - social - environmental interactions, which may be indirect, non-linear, cumulative and synergistic, and by the difficulties of applying monetary values to non-market variables.

The challenges of assessing the "present value" of a natural resource asset based on an expected stream of future resource rent returns are reflected in the ongoing debate among economists about the appropriate discount rate to apply to environmental investments. Discounting is the process of projecting and converting costs and benefits in different years to a common metric so that they can be properly compared to one another.

Some economists recommend the use of a zero discount rate for projects that will directly impact future generations and include irreversible outcomes. This implies that the future is valued exactly the same as the present, and that society doesn't care when the benefits or costs will occur. In fact, the higher the preference for current over future consumption, the higher the discount rate.

Generally speaking, income earned in the future is regarded as being worth less than that earned today, and the opportunity cost of capital or the rate of interest on private loans is recommended by many economists to calculate the expected rates of return from

investments in alternative profitable ventures. This recognizes that businesses and individuals have relatively high rates of time preference and demand a quicker rate of return from ownership of a resource asset than do governments.

A middle ground is used by Statistics Canada in assessing the "present value" of timber and subsoil assets by using the average provincial government real borrowing rate (4%), which is the rate that investors earn on risk-free government bonds. This "social" discount rate reflects the longer time perspective that governments are able to take, and is more appropriate to the assessment of long-term environmental impacts. (Statistics Canada (1997), Cat.16-505-GPE, pp.29-31, 37-38, 48-49; Asian Development Bank (1996), pp.39-42, and p.264).

In other words, the higher the discount rate, the less value society places on the future. Adherence to the principle of inter-generational equity, which is the cornerstone of a sustainable development strategy, would require use of a low discount rate. The debate over appropriate discount rates reflects the fundamental uncertainty inherent in any investment or future-oriented accounting system.

The basic approach to uncertainty we recommend for the Nova Scotia index may be summarized in two basic principles.

First, it is necessary to acknowledge inherent uncertainties and to remain flexible and open to better methods of valuation and new knowledge as they become available. In the meantime, we also recognize that there *are* long-term economic costs to the depletion of a fishery or forest resource, to reducing carbon dioxide emissions, to the loss of agricultural productivity from soil erosion, and to a high crime rate, even though they are difficult to calculate precisely in monetary terms. And we recognize that it is more accurate to establish *some* valuation, based on the best available evidence, than to assign an arbitrary value of "zero" to our resources, as the GDP does, or to measure crime and pollution costs as growth.

It is also more accurate to recognize that there *are* long-term benefits and costs to current economic activity than to track only short-term ups and downs in the *quantity* of activity, as the GDP does. In other words, an index of sustainable development remains a qualitative improvement on our current accounting procedures, which omit certain critical values altogether, even while it remains an imperfect improvement, subject to continuous refinement.

Secondly, there is a virtual consensus in the ecological economics profession that uncertainty is best incorporated into accounting procedures using the 'precautionary principle' of the insurance industry. In essence, investment-oriented accounting procedures are analogous to the calculation of insurance premiums based on the probability of future damages and pay-outs. Both methods establish current values based on past empirical evidence and estimates of future benefits and costs.

When the risks are high and the outcomes uncertain (as for young male drivers or global warming), the precautionary principle dictates that a sufficiently high current premium (and low discount rate) be set to incorporate the uncertainty. As new evidence becomes available, the premiums may be modified accordingly, as for a driver who remains accident-free or a reversal of the trend towards warmer temperatures and carbon dioxide accumulation that have characterized this century. In other words, the discount rate can be appreciated in proportion to the measurable decline in risk for future generations.

In sum, uncertainty can be incorporated into the accounts without resorting to arbitrary guesswork. Even though past empirical evidence will always be an imperfect vehicle for future-oriented decision-making, which is inherently probabilistic by nature, the data base for investment-oriented accounting does exist, and we are already more than familiar with the type of thinking required to shift from a consumption driven to an investment guided economy.

(vi) Proposed Sector-Specific Methods

Based on the literature review, we propose the following valuation methods, which are potentially appropriate and relevant to Nova Scotia circumstances, and which will be tested and then reviewed with policy planners and experts within the relevant government departments. There are several sectors, not mentioned here, for which we are still reviewing alternative methods.

a) Ecological Footprint Analysis

* For the sustainability of consumption patterns, the ecological footprint(EF) / appropriated carrying capacity (ACC) model of Rees and Wackernagel at the University of British Columbia is a powerful and workable tool, although it requires a very large quantity of data input. (See chapter II, 3 (B) iii (c) above). The model has already been applied to Canada, the Lower Fraser Valley, the Netherlands, and regions of India and Germany, so that there is a basis for comparability.

There are difficulties in the calculations of ACC for energy production and it may be wise to include forms of energy resources that are not in the original model. We are also examining two different ways to convert the land-based values of EF/ACC analysis to monetary equivalents. Once constructed, however, the EF/ACC indicator is conceptually easy to understand, clearly links environmental impacts with economic activity, is a good indicator of geographical equity and can be easily adapted to incorporate new data or to show variation by income group or region within Nova Scotia.

The new Statistics Canada Material and Energy Flow Accounts, though currently only compiled at the national level, provide a potentially powerful data base for EF/AAC analysis, particularly since they include the embodied energy and resource content of imports and exports, as Rees and Wackernagel's model does. Future plans by Statistics Canada to regionalize the accounts to the provincial level will considerably enhance the accuracy and comprehensiveness of the Nova Scotia index.

b) Forestry

* For the forestry accounts, the criteria and indicators already specified by the Canadian Council of Forest Ministers represent an appropriate framework that link the measures directly with official Canadian forestry policy and will allow comparability in the future when other jurisdictions adopt the guidelines. The major challenges are that the CCFM measurement criteria have not yet been implemented by any province —we would be the first -- and that they include non-market forest values which are challenging to measure with precision.

In terms of specific methods, the 1991 and 1994 timber accounts and "timber sustainability index" developed by Mark Anielski of the Performance Measurement office in the Alberta Treasury are an appropriate starting point for the Nova Scotia accounts. Mr. Anielski's model also includes specific recommendations for expanding the accounts to include non-timber forest values, and he has begun to do so by developing the

first carbon accounts for Alberta's forests. A DFO study assessing the impact of forestry practices on the Carnation Creek watershed and surface waters, will be a useful model for another non-timber value.

c) Fisheries

* For fisheries, we recommend a very useful model developed by the World Resources Institute in Washington D.C., analyzing the Costa Rican fisheries. First, a sustainable yield curve is calculated plotting catch sizes for each species against fishery "effort", measured in boating size, labour, gasoline, repair, maintenance, equipment costs and so on over time. From those calculations the "maximum sustainable yield" (MSY) for each species can be determined. MSY occurs at the point where the curve flattens out.

Then costs are plotted in direct relation to fishing effort, and the maximum economic return (MER) on investment can be found at the point of the greatest gap between costs and the sustainable yield curve. Since the curve flattens out, with gradually declining yields as the MSY is approached, the point of MER occurs before MSY is reached.

From this measurement it is possible not only to predict the effects of overfishing at particular points in time, but also to determine the number of fishermen and boats that will yield the best return on investment. This is useful for policy makers, who can calculate potential overcapitalization in the fishery (financial, human and plant), and the excess number of fishermen for whom re-training programs might be more appropriate.

A present difficulty is that no annual estimates of stock by species currently exist in Canada, and there is therefore little data from which an aggregate fish stock account can be compiled. Pelagic (or finned) fish and shellfish stocks are estimated by officials only when there appears to be a problem with a localized fishery. Since one of the functions of the Nova Scotia index is to identify data gaps and needs, we shall use the best available data to make projections from existing estimates while pointing to potential improvements in data collection that will allow more direct measurements in the future.

d) Soil and Land

* The Nova Scotia soil accounts can be developed from the U.S. Department of Agriculture's Erosion Productivity Impact Calculator (EPIC), through which ratios can be established enabling a monetary calculation of the costs of erosion on crop production. A 1985 study by Jacques Whitford environmental consultants of the impacts of soil erosion on productivity in Nova Scotia will also be used, and updated with more recent Department of Agriculture and Marketing data.

The new Statistics Canada Land Account, which provides detailed time-series information by province, will furnish quantitative data on conversions of prime agricultural land to urban uses, and can help answer questions on whether land use is becoming more or less sustainable and whether environmental stress associated with land use is increasing or declining. Since the Land Account refers only to surface area and not to soil quality, the EPIC analysis will complement the Statistics Canada account to provide an overall portrait of the health and sustainability of Nova Scotia's agricultural resource.

e) Pollution Abatement and Control

* For pollution abatement and control valuations, we propose using Statistics Canada's EPEA data and methodology in Econnections: Indicators and Detailed Statistics 1997 (Cat.16-200-XKE), which contain the most detailed, advanced and up-to-date material available on environmental protection expenditures in Canada. Since the EPEA currently include only business and government expenditures, proxy values for household

expenditures on pollution abatement and control in Nova Scotia can be developed from data collected in the Netherlands, other European countries and the USA.

The European Community's European System for the Collection of Economic Information on the Environment includes household environmental protection expenditures and will provide the model for future Statistics Canada work on the household sector. For the USA, G. Rutledge and M Leonard's "Pollution Abatement and Control Expenditures, 1972-90" (Survey of Current Business, Vol.72, no.6) and the original GPI column N, "Cost of Household Pollution Abatement", based on data from the U.S. Commerce Department's Bureau of Economic Analysis can both assist in developing proxy values for Nova Scotia.

P.P Rogers' "Cost of Repair Index" (in Environmental Indicators and Indices, Harvard University, 1993) is also useful in supplementing the Econnections methods in calculating business costs in meeting environmental emissions standards.

f) Municipal Waste

* Alberta's A Full-Cost Analysis Guide for Municipal Waste Management is the first Canadian study to incorporate environmental, social, health and financial costs in project analyses of waste disposal methods, and is a useful model both for the Nova Scotia index and for policy analysts in the province.

Statistics Canada's new Material and Energy Flow Accounts (MEFA) currently examine only greenhouse gas emissions in the analysis of waste flows. Major data gaps have prevented the agency from including information on solid waste, waterborne waste, durable-good waste, public sector waste production and leakages from waste inventories at this time. The compilation of new data for solid and liquid wastes, primarily those associated with municipal waste flows and sewage treatment, is a key priority for the agency in the future development of the MEFA and will eventually provide an excellent data base for the Nova Scotia index.

Although current data do not classify solid and liquid waste flows by producer and contain very little detail on the material composition of sewage and household waste, both of which are necessary for the MEFA, it *is* possible to obtain aggregate measures on municipal solid waste, which includes all solid waste collected by, or on behalf of, local municipalities and disposed of in local landfill sites. This aggregate, which can be used for the Nova Scotia index as an interim measure, currently includes solid waste from households, light industries, commercial establishments, office buildings, public institutions and government operations.

In addition, we propose following the Statistics Canada's practice in the Environmental Protection Expenditure Accounts (EPEA) of using existing regulations and voluntary conventions as benchmark standards. In particular, we propose using the standards established in the Canadian National Packaging Protocol (1989) and the Canadian Code of Preferred Packaging Practices to assess the province's progress in this area. Both of these government - industry joint initiatives contain specific targets by quantity and date for graduated steps in solid waste reduction, and are a recommended reference point in the Nova Scotia Round Table's Strategy for Sustainable Development.

g) Transportation

* The Victoria Transportation Policy Institute's Transportation Cost Analysis (Sept. 1997), comparing eleven modes of transportation, is the most comprehensive, up-to-date and well-documented model we have found for this subject, and integrates the work of many other studies. The Transportation Cost Analyzer software produced by the Institute makes the model convenient to adapt to Nova Scotia's needs. Three separate indicators in the original GPI, the services of highways and streets (column G), the cost of commuting (column M), and the cost of automobile accidents (column O) would be included in this more comprehensive transportation cost analysis.

Other Canadian data sources also contain a wealth of useful information that can provide fairly accurate proxies for Nova Scotia where direct measurements are currently not possible. The IBI Group's Full Cost Transportation and Cost-Based Pricing Strategies, developed for the National Round Table on the Environment and Economy estimates costs for automobile, public transit, truck, rail and air travel in Ontario. Costs are divided into user charges, external costs and government subsidies and include cost estimates for vehicle ownership and use, accidents, parking, congestion, road facilities, municipal services and air pollution.

Travel time values are not estimated in the Ontario report, but the British Columbia Ministry of Transportation and Highways has a detailed study on the subject, The Value of Time Savings for the Economic Evaluation of Highway Investments in British Columbia, prepared by William Waters, which calculates travel time costs as a function of both current average wage rates and traffic congestion levels. The latter are graded by "Level of Service" (LOS) ratings, with higher multiplier rates for worsening congestion levels. Thus LOS D increases travel time costs by a factor of 1.33. Costs are multiplied by 1.67 for LOS E and by 2.0 for LOS F. Since these "levels of service" are clearly defined, the British Columbia data can be readily adjusted to Nova Scotia wage rates and traffic congestion levels to include travel time costs in the transportation component of the provincial index.

We also propose using the Canadian Automobile Association's estimation of fixed and variable automobile costs, and the British Columbia Ministry of Transportation and Highway's Monetization of Environmental Impacts of Roads (March 1997) KPMG has done full cost analyses on transportation costs in Edmonton (1996) and the British Columbia Lower Mainland (1993), which can serve as tests for the Ontario data. In addition, there are several American, British and other European reference studies that can be used to develop maximum and minimum ranges for costs when direct Nova Scotia measurements are not available and to ensure comparability both nationally and internationally (see bibliography).

h) Income Distribution

* Income distribution can best be assessed using the GINI coefficient. Since that methodology is currently used by the World Bank and other international agencies, comparability of the Nova Scotia data with other jurisdictions world-wide will be possible for this indicator. To cross-test the measure, we shall use Statistics Canada data for a time series on quintile shares of income, and for the percentage of the province's population below the low income cut-off. For policy purposes we propose disaggregating this data to provide information on changing trends within different social groups.

The after-tax GINI coefficient will be the main indicator of progress towards greater intra-generational equity. Statistics Canada (Cat. no. 13-210) has GINI coefficients by

province for 1990-1993 for income before and after transfers and after tax, and has directly provided the Nova Scotia project with a break-down of data by province for a time series from 1971 to 1994. This will enable comparability with other provinces and with the national average, and will enable an accurate assessment of the contribution of federal transfers and taxation policies to greater equality within the province.

An alternative methodology, used by some European countries, assesses trends towards equity or inequity based on consumption differentials rather than income. In the long-run this is probably a more accurate indicator since it smoothes out seasonal and time-sensitive fluctuations in income which may have little direct impact on lifestyle patterns. Furthermore, unlike income, consumption differentials are an outcome-based measure that registers the impact of inequities on actual behaviour. To be accurate, a consumption indicator of equity would have to be adjusted for changes in debt loads. According to Statistics Canada staff, existing data do not currently allow application of this methodology in Canada, although it will be possible in the near future, providing an interesting potential test against the after-tax GINI coefficient.

In the meantime, lower GINI coefficients signify a trend towards greater equality and thus raise the genuine progress index, and higher GINI coefficients bring the index down. Attempts will be made to adjust the measurements according to changes in debt load by income group.

The original GPI attempted to incorporate consumption patterns indirectly by adjusting the index according to the share of income held by the *lowest* quintile of the population, after transfers but before taxes, rather than in accordance with the GINI coefficient. The argument, from standard economic theory, is that the poorest sector is the group for which each increment of consumption adds the most to well-being, and that the actual value of extra income declines as family income increases. Thus, the poor benefit the most by increases in family income and the share held by the lowest 20% provides a fair gauge of net gain or loss in overall social welfare. This was also the reasoning used by the United Nations Development Program in discounting higher incomes for the Human Development Index (HDI).

Since these quintile shares are readily available by province from Statistics Canada, the original GPI method will also be used as a test for the GINI calculations, and differences in the trends will be noted.

One weakness of the original GPI method is that trends are assessed against an arbitrary base year (1951) set at 100, with other years indexed according to that base. Use of the GINI coefficient has the advantage of an internal reference point, where lower values assess progress towards actual equity rather than towards a level that happened to exist in a particular year and which, by implication, represents the "acceptable" range of inequality.

i) Durability of Consumer Goods

* For the cost and services of consumer durables, we shall use the original GPI method of subtracting the former and adding the latter, in order to assign value to durability. However, rather than use a single rate of depreciation for all durables (15%), as the original GPI did, we propose using Statistics Canada data to assess separate rates of depreciation for different categories of durables, in order to find out whether some types are lasting longer and others are being replaced more often.

Needless to say, this information will also impact waste disposal issues and can serve as an interim proxy for trends in durable good wastes, for which data are currently almost entirely lacking in Canada. Since a direct relationship between durable good purchases and waste flows is not proven, we intend to work with Statistics Canada in developing a model that includes depreciation rates to estimate durable waste flows for the province.

j) Foreign lending and borrowing

* For the calculation of net foreign lending or borrowing, we also propose using the original GPI method, subtracting only that portion of loans used to finance current consumption as opposed to investment. The basic logic of this indicator is that if foreign debt is incurred to finance current consumption, future generations will experience a net drain of resources as the loan becomes due. The measure is therefore an indicator of inter-generational equity.

k) Unpaid Work

* The value of housework is derived using the generalist replacement cost method, and for volunteer work using the specialist replacement cost method. The dollar values for these categories are derived from the Statistics Canada data. Opportunity costs, which would yield considerably higher figures, are not used in this analysis. International comparability is possible using Dr. Andrew Harvey's eight country study of the value of unpaid work. A statistical profile of women's status in this area will also be constructed, incorporating paid and unpaid work as well as changes in leisure time resulting from the shifting balance between the two work sectors.

l) Costs of Crime and Litigation

* The costs of crime can be derived using valuation methods from two recent studies —by the Fraser Institute and by the National Crime Prevention Council. Nova Scotia government justice costs, including incarceration, police and courts, can be constructed in time series form from the Statistics Canada data, as can some private and business expenditures, such as spending on security guards and private investigators (see bibliography for sample references). Proxy valuations of social and victim costs for the province will be estimated from the national data. As described above in the discussion of sectoral accounts, the proposed method differs from that of the original GPI by including government expenditures.

The Canadian Centre for Justice Statistics in Ottawa is currently providing invaluable assistance to the Nova Scotia study by reconstructing provincial data from original material in cases where published reports only report national figures and trends.

Data on some specialized categories will be gathered from industry sources. For example, both the Canadian Insurance Congress and the Canadian Coalition Against Insurance Fraud have estimates of the costs of insurance fraud. When separate provincial data on such issues are hard to obtain, the Nova Scotia "share" of the national total will be estimated based on the province's share of insurance premium costs.

We also propose including civil justice and litigation costs as a whole as a deduction in the index, on the grounds that these are almost always "regrettable" expenditures which do not produce a net gain to welfare, with a few exceptions like performing marriages. The logic is the same as for defensive expenditures in relation to the environment, discussed above.

We propose *excluding* from the Nova Scotia index the "cost of family breakdown" (column I of the original GPI) on the grounds that it is difficult to justify all divorce as a cost. In the case of an abusive relationship, divorce may produce a net gain in welfare. This is shaky ground, and so we have avoided this category altogether until a consensus can be reached. Instead, it makes sense to extract the legal costs of divorce as a clear regrettable expenditure, and to subtract these from the index as part of general litigation costs.

One policy goal for this category of expenditures is to construct a simple correlation between costs of crime and crime rates in different categories. This will enable policy makers to estimate the savings produced by a drop in a particular type of crime.

(vii) Methodologies Under Consideration

We are still assessing alternative methodologies for several other indicators, including the value of nonrenewable resources, loss of wetlands, costs of carbon emissions, costs of underemployment, and the valuation of leisure time. In these cases we are not yet ready to recommend a particular methodology definitively, but will undertake further research and consultations before proceeding with data collection.

a) Leisure Time, Underemployment and Livelihood Security

No decision has yet been made, for example, on the alternative valuations of leisure time proposed by Nordhaus and Tobin on one hand, and by the original GPI on the other. We are also examining ways of incorporating the cost of underemployment (column K in the original GPI) and trends in involuntary part-time work into an overall index of livelihood security.

b) Nonrenewable Resources and Renewable Energy Substitutes

The physical and monetary Subsoil Asset Accounts (SAA) in Statistics Canada's new Natural Resource Asset Accounts (NRSA) are the logical basis for the Nova Scotia valuations for coal, minerals and natural gas deposits, and will allow comparability with other provinces as well as direct linkage with the new Canadian System for Environmental and Resource Accounts as a whole. Adjustments must be made for the particular types of coal mined in Nova Scotia, and also for new developments in natural gas exploration and exploitation which have not yet been incorporated into the SAA.

The natural resource account framework of the Norwegian government is also being studied for potential inclusion of non-market costs into the Nova Scotia accounts. It should be noted that Statistics Canada still regards its new accounts in this field as a "work-in-progress" and plans to overcome acknowledged shortcomings in its valuation methods in future work. It is our hope that, beyond simply replicating Statistics Canada's current work at the provincial level, the Nova Scotia study can actually contribute positively to the future development of the CSERA as a whole.

As noted earlier, the nonrenewable resource accounts are based on a qualitatively different foundation than the renewable resource accounts in that exploitation of subsoil assets is not sustainable by definition, since they can only be depleted. While the assumption of "non-substitutability" of different forms of capital is central to the definition of "strong sustainability" discussed above, a different standard must be developed to assess progress towards "sustainable" use of nonrenewable resources unless every additional use of subsoil assets pulls the overall index down.

We have not solved this methodological dilemma. But there seems to be a consensus in the ecological economics profession that nonrenewable resources are used "sustainably" only to the extent that renewable substitutes can be produced at the same rate as the renewable assets are depleted. Further consultations are necessary to operationalize this linkage. Clearly two elements will be to measure and gauge trends in government, business and household investments in renewable energy sources and to track the changing ratios of nonrenewable to renewable energy usage. If possible, the linkages should be assessed in both physical and monetary terms in order to derive an accurate pricing system for nonrenewable resource use.

c) Carbon Accounts

Basic data for the cost of carbon emissions for Nova Scotia are based on the greenhouse gas flows in Statistics Canada's Material and Energy Flow Accounts (MEFA). Since the MEFA are physical rather than monetary accounts, however, we are examining several proposed methods for monetizing the cost of these flows.

Among the possibilities being studied are RCG/Hagler Bailly's "Global Climate Change Balance Spreadsheet" which calculates dollar damages per tonne of carbon emissions (in J.B. Smith et.al., Standardized Estimates of Climate Change Damages for the United States, 1994), and estimates by W.R. Cline in The Economics of Global Warming (1992), Institute for International Economics, Washington D.C., and by W.D. Nordhaus in "To Slow or Not to Slow: The Economics of the Greenhouse Effect" (1991) in The Economic Journal (101), pp.920-937.

Higher dollar estimates of damage per tonne than these have been estimated by David Pearce in Economic Values and the Natural World (1993), MIT Press, Cambridge, and by S. Fankhauser in Global Warming Damage Costs: Some Monetary Estimates (1992), CSERGE GEC Working Paper 92-9, Center for Social and Economic Research on Global Environment, Norwich. Fankhauser and Pearce together have calculated monetary estimates in their paper, "The Social Costs of Greenhouse Gas Emissions" (1993) presented to the International Conference on the Economics of Climate Change in Paris, sponsored by the OECD.

In the wake of the recent Kyoto treaty, new studies are currently being undertaken to calculate the estimated costs of Canada's compliance with the reductions and targets agreed to at the conference. Since the range of variability is wide in previous estimates and can be expected to remain so in the new studies, it is proposed that maximum and minimum damage costs be presented in estimating the impact of Nova Scotia carbon emissions.

In accordance with the earlier discussion of defensive environmental protection expenditures, these compliance costs are initially a proxy for earlier damages or natural capital depreciation in the stock accounts. Improved flows of environmental services resulting from the current investment sacrifice will register as benefits that show progress towards sustainability in the index.

In addition to the monetary estimates, we are proposing an expansion of the physical carbon accounts in the MEFA through development of a carbon emissions sustainability index based on the fisheries model described above. Using Dr. Bill Freedman's figures (Environmental Ecology, 1994) on the balance between natural absorption and emissions of carbon as a starting point (corresponding to the "zero effort" point in the fisheries model), it should be possible to determine the "maximum sustainable yield" equivalent

for that level of human carbon dioxide emissions that will not produce a net increase in atmospheric carbon dioxide stocks.

Based on that calculation, it should be possible to construct flow accounts measuring the degree of depreciation of the capital asset defined as the "optimum climate regulation function" of the carbon balance of the atmosphere. Nova Scotian carbon dioxide emissions can then be measured against these stock and flow accounts to determine the degree to which our current practices are sustainable or unsustainable.

Once again, it must be emphasized that all proposed methods are provisional and subject to continuous improvement and refinement. After testing and application of available Nova Scotia data, the sectoral accounts will be referred to the relevant government departments and to experts in the field for input, feedback and modifications.

d) Valuing Biodiversity and Wetland Services

These are among the most challenging environmental functions to quantify in composite indices of sustainable development and well-nigh impossible to monetize. Contingent valuation techniques have been used to gauge public interest in protecting endangered species, but it is highly questionable to ascribe dollar values to complex species roles in which human functions themselves form but one link in an interdependent chain (See R.C. Mitchell and R.F. Carson, Using Surveys to Value Public Goods: The Contingent Valuation Method (1991), Resources for the Future, Washington, D.C.). A more promising approach being considered for the Nova Scotia study is application of the Biodiversity Indicators for Policy Makers developed by W.V. Reid et.al (1993) for the World Resources Institute in Washington, D.C.

British Columbia's Progress B.C. report assessed the province's progress towards biodiversity sustainability according to three inter-related criteria: ecosystem diversity, species diversity, and genetic diversity. Measurements are taken for plant communities at risk, for protected areas, for the proportion of biogeoclimatic subzones protected, for plant and animal species at risk and for salmon and trout at risk. Efforts will be made to assess data availability for comparable assessments in Nova Scotia.

The methodological problems of assessing the value of wetlands are somewhat different. Monetized estimates have in fact been made for the flow of services from wetlands, partly using replacement cost techniques. For example, wetlands are recognized as one of the most cost-effective means of reducing nutrient loading to lakes and sea bays (I.M. Andreasson-Gren, "Costs for Nitrogen Source Reduction in a Eutrophicated Bay in Sweden", in C. Folke and T. Kaberger (eds), Linking the Natural Environment and the Economy (1991), Kluwer). Just as the economic costs incurred to reduce carbon dioxide emissions can be used to value the function of forests as carbon sinks, so the cost of alternative means of nutrient retention and cycling to maintain nitrogen balance can be used to value this function of wetlands.

The problem is that nutrient cycling is just one of multiple wetland functions and it is extraordinarily difficult to assign weights or derive a common metric for aggregating the different values. Dennis King, in a report prepared for the U.S. Environmental Protection Agency, "Wetland Creation and Restoration: An Integrated Framework for Evaluating Costs, Expected Results and Compensation", lists 22 significant wetland functions with associated services and values. These include groundwater recharge and discharge to maintain healthy drinking water, floodwater storage conveyance and storm wave/surge protection to reduce soil erosion, shoreline anchoring to protect beaches, sediment trapping which maintains aquatic ecosystems and reduces dredging requirements,

pollution assimilation which reduces treatment costs, biodiversity storehouse which has direct and indirect values for scientific and medical discoveries, genetic pools and seed banks, carbon cycling, microclimate regulation, habitat, food-chain support and many more.

It is not surprising then that aggregate estimates of the value of wetland functions vary enormously. The original GPI valued the flow of services from an acre of wetland at $US1,390 per acre, and calculated the cost of the loss of wetlands in the U.S. accordingly. Other estimates are three to 20 times higher. (See Lugo and Brinson, "Calculations of the Value of Saltwater Wetlands", in Phillip Greeson, et.al., Wetland Functions and Values (1979), American Water Works Association, Minneapolis).

On the other hand, the original GPI valuation of the loss of wetlands is nearly eight times higher than the cost of crime, even though the latter probably has much higher priority in the public mind. In costing losses, how do we balance such subjective perceptions against the lack of public knowledge about wetland functions? Further, like the depletion of nonrenewable resources, the loss of wetlands will register as a linear trend towards unsustainability if only stock accounts are considered.

There are no easy answers to these dilemmas. Some useful methods worth examining to calculate the value of wetlands in Nova Scotia include two studies prepared for the U.S. Army Corps of Engineers: P.R. Adamus et.al., Wetland Evaluation Technique (WET), Vol.II: Methodology, (1987), Operational Draft Technical Report Y87; and William Waide, Analysis of Selected Wetland Functions and Values, (1981), Report 81D-01, Institute for Water Resources, Arlington, VA.

Aggregate indices of the relative health of aquatic ecosystems include James Karr's Index of Biological Integrity (1992) in R. Costanza, et.al., (eds), Ecosystem Health: New Goals for Environmental Management, and Robert Ulanowicz's Index of Ascendancy which evaluates ecosystem performance according to species richness, niche specialization, developed cycling and feedback mechanisms, and overall activity (in Costanza, op.cit.)

One appealing approach is Dennis King's "The Economics of Ecological Restoration" (1992) (in K Ward and J. Duffield, eds., Natural Resource Damages: Law and Economics), first of all because he shows that ecological damage *is* reversible, contrary to the impression gained in the original GPI valuation, and secondly because he presents a workable costing technique for wetland damage and restoration.

King's analytical framework measures the positive correlation between the amount of effort and resources committed to restoration activities (*cost*), the *level* of ecological function that it is possible to restore, and the *speed* at which ecological functions can be expected to recover. He compares low, medium and high cost restoration efforts against increased habitat productivity as a percentage of capacity and the number of years required to reach these levels.

This is precisely the type of linkage that Statistics Canada wants to achieve in the future in integrating its Environmental Protection Expenditure Accounts with the Material and Energy Flow Accounts. As discussed earlier, restoration costs can serve as a proxy for the value of ecological disturbance or loss.

e) Health, Education and Social Values

Methodologies have not yet been developed for these areas. Some preliminary proposals are:

(i) to separate preventive health costs from expenditures to treat illness and accidents;
(ii) to use outcome measures for health and education rather than expenditure inputs as measures of progress;
(iii) to use functional literacy and standardized test results to evaluate educational attainment rather than numbers of graduates;
(iv) to apply the existing internationally recognized Human Freedom Index (HFI) to Nova Scotia;
(v) and to test existing indices of the "social caring capacity of a community" in Nova Scotia. (See L. Aronson and M. Charles, The Social Caring Capacity of a Community: A Literature Review, report to the UBC Task Force on Healthy and Sustainable Communities, Vancouver).

More work is required in all these areas before definitive methodologies are proposed for the Nova Scotia index.

4. Empirical Testing in Five Sectors

Data collection is well under way on five indicators of the Nova Scotia sustainable development index:

a) Unpaid sector: valuation of household work and parenting, using the generalist replacement method;
b) Unpaid sector: valuation of volunteer work using specialist replacement method;
c) Valuation of leisure time using both the Nordhaus and Tobin method of assigning positive values for hours of free time, and the original GPI method of deducting loss of leisure from the base year with the highest value for leisure in the time series. This value is also being tested against changes in the length of the work week in Nova Scotia over time.

For all the above, we have used Statistics Canada's General Social Surveys and the dollar values specified for Nova Scotia. In addition Statistics Canada is helping us to reconstruct, from the micro-data, considerable numbers of provincial figures which are not in the published studies. Preliminary results reveal that the value of the unpaid household sector is proportionally greater in Nova Scotia than in any other province, constituting 42% of the value of provincial GDP.

A preliminary profile of women's status in the three categories described above reveals that despite a 50% increase in the number of women in the paid work force since 1961, there has been only a very marginal decrease in women's share of the unpaid productive sector. This has produced a net increase in total working hours and corresponding decline in leisure time for women during the past 30 years in relation to men for whom leisure time has marginally increased during the same period.

In a cross-country comparison, total weekly work hours are longer for Nova Scotia and all Canadian provinces than for all western European countries surveyed, but shorter than for the United States. More work and analysis is needed with all this material before any conclusions can be drawn.

d) Income distribution. We have recently obtained from Statistics Canada in Ottawa the unpublished provincial after-tax GINI coefficients. This saves us making separate adjustments for taxation inequities. Initial results reveal slightly greater income equity in Nova Scotia (0.343 GINI coefficient) than the Canadian average (0.351). The effect of transfer payments is clear by comparing the GINI coefficient for income distribution before transfers, which reveal greater inequality in Nova Scotia (GINI: 0.523) than in any

other province except Newfoundland. Transfers have a major impact on reducing inequality.

Comparisons with the United States reveal that growing income inequality was one of the main reasons for a sharp decline in the original genuine progress index developed for the United States. A replication of the same methodology for Canada demonstrated a considerably less marked inequity, causing the GPI to remain relatively steady. Initial perusal of the income distribution data therefore appear to indicate that Canada (and Nova Scotia) fare considerably better in "genuine progress" terms than the United States.

As noted above, some European countries base their equity calculations on consumption expenditures for different quintiles and on a GINI ratio for consumption. While that may well be a more accurate gauge of differences in actual standard of living than income distribution, we have found that the provincial data do not currently allow this calculation in Canada. According to Hans Messinger, Statistics Canada is planning to use the consumption measure of equity in the future, in addition to the current income distribution measures.

(e) We have also collected considerable quantities of data on the costs of crime and litigation in Nova Scotia, mostly from the Canadian Centre for Justice Statistics. Much of this is already available by province, and we have so far finished tabulating total government spending on justice services (including police, courts and prisons), security guards and private investigators for Nova Scotia, and completed the first set of inter-provincial comparisons.

Per capita justice costs in Nova Scotia ($192) are 87% of the Canadian average ($220), and are well below per capita costs in Ontario (79%) where justice services cost $243 per person and British Columbia (82%) whose citizens each pay $233 a year for justice These savings are available to Nova Scotia for more productive purposes. It should be added, however, that initial inter-provincial comparisons show Nova Scotia crime rates (both total and violent) to be considerably higher than the other three Atlantic provinces, and are in line with Canadian averages. We are still in the process of constructing correlations between rates and costs of crime.

(f) We have also begun testing our natural resource accounting methods through application to the Nova Scotia forestry sector. Although this is still at a preliminary stage, early data collection from the Nova Scotia Forest Production Surveys, 1991-95, and from the Compendium of Canadian Forestry Statistics, 1995 has revealed some alarming statistics that at first glance appear to support the conclusion of the National Round Table report on Private Woodlot Management in the Maritimes that we are currently harvesting timber unsustainably and that the forestry industry in the province is potentially under threat.

The figures show Nova Scotia softwood harvesting at 13% above the annual allowable cut (AAC) for 1994. On private woodlots, the cut was 46% above the AAC. Between 1993 and 1995, total softwood and hardwood harvesting jumped 41% in volume on private woodlots. The woodlot figures are significant because woodlot harvesting is 55% of the provincial total in Nova Scotia (Forestry Canada, Private Woodlots in Canada). In fact, there is some suspicion that the actual figures may be higher yet, because of under-reporting by woodlot owners.

It is too early in our analysis to interpret these figures, and we have not yet translated the volume statistics into dollar values. We are still in the process of applying Statistics Canada's net price and present value formulations from the new Timber Asset Accounts

to Nova Scotia as well as Anielski's "timber sustainability index" from Alberta. Nor have we yet factored in non-timber forest values.

Before coming to any conclusions we intend to check the accounts with the Department of Natural Resources and Forestry Canada. In the course of all these test applications, it will be necessary to refine, adjust and improve the methodologies.

5. Inter-departmental Consultation: March, 1998

Planning and preparation have begun for a full day inter-departmental working consultation on the new index in early March, 1998 for 30 to 40 provincial and federal officials. The Priorities and Planning Secretariat has offered to issue the invitations to the meeting at the end of January. A background package of materials, including this document, has been prepared to accompany the agenda and invitations.

Executive directors of policy and other key policy planners in relevant N.S. government departments who have been directly involved in the outcome measures initiative have been invited so that work on the sustainable development index can be coordinated with and contribute to future *Government by Design* reports. Members of the Fiscal and Economic Policy division and the Bureau of Statistics in the Department of Finance have also been invited as have representatives from the Ottawa and Atlantic region offices of Statistics Canada have been invited as have key Atlantic region officials from A.C.O.A., Environment Canada, Forestry Canada and D.F.O.

The consultation has two primary objectives. Firstly, key Statistics Canada representatives will present the basic purpose, development and future directions of the new systems of expanded economic accounts that include environmental and social variables, in order to familiarize participants with the fundamental concepts and methods underlying the proposed Nova Scotia index of sustainable development.

The second major purpose of the consultation is to initiate a process of soliciting input from provincial and federal government officials both on the basic framework and values of the new index and on more specific design features to make the new accounts practical, relevant and easy to use for policy planners. In addition, since Statistics Canada has designated the Nova Scotia sustainable development index as a pilot project for the rest of the country, the consultation will be the first step in mobilizing resources and creating a framework for ongoing cooperation to ensure that the final product represents the contributions of all relevant departments and reflects a broad consensus within government.

(a) Morning Session: Presentations and Discussion led by Statistics Canada, Ottawa, Representatives.

The Chief Assistant Statistician, Stuart Wells, has been invited to give the keynote address on the future directions of Statistics Canada's sustainable development indicator work and the relationship of the Nova Scotia pilot project to this work. Robert Smith from the agency's Environment Division will present the new Canadian System of Environmental and Resource Accounts, and Chris Jackson, who has designed Statistics Canada's valuations of unpaid labour and leisure time, will present the social dimensions of the new accounts.

Hans Messinger, Assistant Director for Inter-provincial Trade and Socioeconomic Indicators in the agency's Input-Output Division, will then explain the relationship of the new accounts to conventional measures like the GDP. Mr. Messinger has been requested

by the Assistant Chief Statistician to replicate the original Genuine Progress Index for Canada as a step in the development of new indicators of progress for the country, and to assist and work actively in the development of the Nova Scotia index of sustainable development.

Mr Messinger has, in turn, arranged for assistance to the Nova Scotia pilot project from Statistics Canada's Atlantic region office, and has mobilized other agency researchers to help reconstruct Nova Scotia provincial data from Statistics Canada's unpublished files and materials. Mr. Messinger's June 1997 paper, Measuring Sustainable Economic Welfare: Looking Beyond GDP, will be distributed to participants at the consultation.

The Statistics Canada representatives will explain the agency's interest in the Nova Scotia project, and its significance for the rest of the country and will answer questions in their areas of expertise. After a 10.30am coffee break all four speakers will lead a discussion on the basic principles of the new index of sustainable development and their relation to current accounting methods, including the GDP. Lunch will be provided to participants, to maintain continuity and to provide an opportunity for ongoing informal discussions.

b) Afternoon Session: The Nova Scotia index of sustainable development.

The afternoon session will consist of two parts. First, there will be an open discussion on the proposed framework, principles and values of the Nova Scotia sustainable development index in order to clarify uncertainties, to determine the extent of agreement that already exists on the basic principles, and to identify issues that will require further consensus building efforts.

One basic purpose of this session is, in effect, to clarify the vision which the new index reflects. What we measure is what we value or designate as having "worth". An accounting system is therefore simply the way we measure progress towards the goals that will define the province's vision of the future. This understanding is also the basis of Nova Scotia's *Government by Design*, which begins with a mission statement and definition of "Quality of Life" criteria for the province, followed by a description of the basic goals of public policy.

The first afternoon session might therefore begin to consider the extent to which the basic vision and goals of the new index are already aligned with the stated purposes of Nova Scotia's *Government by Design*, and how the index's specific concern with issues of "sustainability" might be incorporated more concretely into that plan. Individuals and businesses take the cues for their behaviour from the system of economic incentives and penalties. Therefore, if the new index can gradually develop into an economic accounting component of the *Government by Design*, it has the potential of helping to translate the outcome measures into practical policy initiatives.

Needless to say, this is a long-term goal in which the policy orientation of *Government by Design* and the economic accounting framework of the sustainable development index can eventually become two sides of the same coin. But the inter-departmental consultation will have achieved its purpose if it initiates a constructive dialogue between these two indicator initiatives, advances both processes another step, and continues the search for a consensus on Nova Scotia's vision as we enter the new millennium.

Following afternoon tea, the consultation will become a practical hands-on working session to give participants direct experience in working with the principles and assumptions of the new index. The first part of the afternoon session will take place in plenary. Following tea, the participants will break into smaller working groups, and then

reassemble for a closing plenary meeting which will solicit feedback, proposals and views from the participants. The day will conclude with the presentation of a framework for ongoing informal consultations to establish a dynamic process for continued dialogue and cooperation.

The session following afternoon tea will have a very specific task, which is designed to clarify one of the main differences between the approach of the genuine progress index and that of the GDP. As noted earlier, the GDP measures short-term *quantitative* growth, while the GPI measures *qualitative* development with a long-term perspective. While the GDP aggregates all economic activity without distinguishing benefit or harm to quality of life, an index of sustainable development estimates the differing benefits and costs of alternative economic activities, to assist decision makers in prioritizing policy alternatives on the basis of accurate information.

An index of sustainable development therefore requires different classifications of economic activity than those to which we are accustomed. Qualitative distinctions, previously hidden, are made explicit, and previously undifferentiated sectoral categories must be disaggregated according to the purposes for which each component is intended.

In the second afternoon session, therefore, participants will be provided with working sheets and asked, in small working groups, to re-classify a few sample components of the GDP into six categories, according to the investment-oriented requirements of a sustainable development index. In order to assess the benefits and costs of different economic activities, it is necessary to determine which classifications we can reach agreement on, and which will require further consensus building effort. The six classifications are:

(i) Which categories of economic activity clearly contribute to *current* welfare and create social benefit with few identifiable costs. This classification itself has three component parts:

a) basic personal needs, like food, shelter and clothing;
b) discretionary personal spending, like recreation, vacations;
c) direct assistance to others, like elderly care, child-rearing.

(ii) Which activities detract from welfare and cause *current* harm, damage and social costs, like crime, auto accidents and oil spills.

(iii) Which current expenditures produce no immediate welfare gains (and may necessitate current sacrifice), but are designed to produce positive benefit in the *future*. These include capital investment expenditures in natural, human, produced and social-cultural capital, like education, preventive health care, protected areas, and infrastructure.

(iv) Which types of economic activity have overt or hidden long-term costs and the identifiable potential to create *future* harm. These include depreciation of human, natural, produced or social capital assets, by resource depletion, tobacco use, problem gambling, pollution, shoddy manufacture, job insecurity, stress and the like.

(v) What are "defensive" expenditures, which do not produce any net gain to welfare, but are designed to ward off harm, limit damage, or repair and clean up past damage, like burglar alarms and security systems, water and air filters, legal and insurance costs, pollution cleanup. (Note the earlier discussion of definitional problems with this category, which can be further explored during the March consultation).

(vi) What are "intermediate" expenditures, which produce no net gain to welfare, but are necessary in order to accomplish a different primary objective, like commuting to work, moving expenses, etc. The authors of the Australian GPI application have reclassified most activities in the unpaid household sector, like cleaning, shopping and meal cleanup, as "intermediate" costs incurred to accomplish two main objectives —provision of food and accommodation.

Needless to say, it is virtually impossible to separate out economic activities so neatly, since almost all expenditures fall into more than one category. Buying a house contributes to current needs for shelter; it is a long-term investment, and it involves defensive expenditures like legal and insurance costs. Health expenditures are partly preventive investments, and partly defensive. Yet it is useful to disaggregate such commonly accepted categories in order to distinguish where the greatest benefits to long-term welfare and sustainability actually lie, and where costs can be cut to minimize potential harm.

Defining costs and benefits is a daunting enterprise, yet households and businesses must do so all the time, however imperfectly. Indeed, simply *attempting* to make the distinctions is useful in order to sharpen our understanding and make more informed decisions.

It should be recalled that the GDP solution to this dilemma is simply to add all paid economic activity together without any distinction at all, except to omit almost all natural, human and social capital. That approach to which we are accustomed, however, produces the anomalies discussed above like the great contribution made to the GDP by oil spills, war, crime. lawsuits and natural resource depletion. As Statistics Canada has pointed out, expenditures that contribute to the GDP are currently "assumed implicitly to be welfare-enhancing". By contrast, the GPI approach examines that assumption more carefully and attempts to assess "genuine progress" by adding only those activities which actually contribute to well-being and prosperity in whatever capital form they exist.

Once we define development as *qualitative* improvement rather than *quantitative* increase, the greatest challenge in the new indices and measures of progress is to define precisely what to add and what to subtract. If we are to use the new accounts as a basis for policy and investment choices, it is most important that the accounting system reflect a consensus on what actually constitutes benefit and what constitutes harm. This will not be accomplished in a single afternoon. But the inter-departmental consultation is designed to initiate this process and establish the basis for an ongoing discussion.

Chapter End Note

Because of the widespread recognition that the time is ripe for the construction and application in practice of indices of sustainable development, there has been considerable receptivity and interest in the Nova Scotia pilot project. We have been particularly heartened at the acknowledgment received so far that Nova Scotia is taking a lead in this enterprise.

The creation of formal research links with Statistics Canada and with the organizations and individuals described in this chapter has already generated some economic benefit for the province in the form of visits to Nova Scotia by researchers and federal government officials interested in the project. It is not unreasonable to expect that, as we progress, more people will come here to learn from our experience.

III PROJECT DEVELOPMENT: 1998-99

1. Goals and Objectives

As described in Chapter II, the initial exploratory and feasibility stage of the study is complete. Strategic partnerships and cooperative working relationships have been, and are continuing to be, created with Statistics Canada, key provincial and federal government officials, and leading researchers, experts and research institutes in the Atlantic region, Canada and the United States. A de facto Advisory Council for the project is now in place. Several meetings and presentations on the work in progress have already taken place. Statistics Canada has designated the study as a pilot project and set up a network for support and assistance in data collection.

As the result of an extensive literature review, sixteen indicators have been selected and prioritized and the basic framework, goals, and methodologies for the study have been established. Data collection and empirical testing is under way in five sectors of the accounts. Perhaps most importantly, a process to solicit input and feedback on a continuous basis from government officials and researchers on all aspects of the project has been created, beginning with the inter-departmental consultation scheduled for March, 1998, and continuing with discussion papers and meetings with departmental policy planners through the life of the project.

A solid foundation has been created to continue with the substantive data collection, compilation and analysis phase of the project, and to construct a working index of sustainable development for Nova Scotia, with particular attention to the creation of comprehensive sectoral accounts for the designated indicators.

Throughout the process, attention will be paid to building consensus on the goals, principles and methodologies of the index, and to ensuring its policy relevance and practical ease of use for policy purposes. A major goal of phase two, therefore, is to develop the index sufficiently that it can begin to provide clear, accurate and precise information for concrete benefit cost analysis to assist policy makers in evaluating alternative investment strategies and long-term policy planning choices.

Please see Chapter I, section 5, for a summary description of the basic goal of the project as a whole. More specifically, the objectives of phase two are as follows:

Goal One: Creation of Sectoral Accounts

Phase two aims to lay the foundations for comprehensive economic accounts for Nova Scotia for the following sectors: natural resources — forestry, fisheries, soil and non-renewable resources; atmospheric emissions; transportation cost analysis; costs of crime; the unpaid work sector — household work and volunteer work; the value of leisure time; costs and services of consumer durables; income distribution; and the ecological footprint analysis of Nova Scotia consumption patterns.

Preliminary data collection and analysis will also begin on the following : net foreign lending and borrowing; water quality; valuations of biodiversity and wetlands services; environmental protection and deterioration, including pollution control and abatement; the livelihood security index and costs of underemployment; health care; education; and the "human freedom index". It is important to recognize that the index can always be expanded to include more indicators and measures at later stages of development.

Because of the broad scope and long-term perspective of the project, the caveats mentioned in Chapter I (5) are important to note, particularly the reliance on already existing data rather than the generation of any new data. In this phase, the goal is not to present a final form of the Nova Scotia GPI, but to develop the index sufficiently to operationalize enough indicators to demonstrate their usefulness to government and industry. As one Nova Scotia government official expressed at a recent Statistics Canada presentation on the GPI in December, 1997, "we want to test drive" at least some of the components of the index. That is precisely our primary goal in phase two.

We are more concerned to create meaningful and usable sectoral accounts in phase two than to aggregate the indicators into a composite bottom line for the index as a whole. That process requires complex weighting issues and careful avoidance of double-counting that should probably await the next stage of development. For policy purposes, the sectoral accounts are in any case far more relevant.

In addition, a clear framework for further development of the index, including recommendations for new forms of data collection, will be ready by the end of phase two. As mentioned in chapter I(5), we anticipate a five-year time frame for the complete construction of a comprehensive index of sustainable development, with ongoing improvements in valuation methods and data availability well into the future. It is our hope that as official familiarity with the new forms grows during phase two, the index will be formally adopted as part of a Nova Scotia government strategy of sustainable development.

Goal Two: Contribution to Outcome Measures

A primary goal of the project is to contribute to and strengthen the Nova Scotia government's existing outcome measures by adding the dimension of an economic benefit cost analysis to some of the indicators in that initiative. The objective is to have the first sets of data available by May 1998 in time for consideration by the Priorities and Planning Secretariat in preparing the 1999-2000 *Government by Design.*

The following steps will be taken to coordinate the sustainable development index with the outcome measures initiative:

(i) Alignment of the vision and goals of the two indicator initiatives. One objective of phase two is to discuss ways in which the concept of sustainability can be incorporated into the current statement of goals in the *Government by Design.* (It should be noted that

it is already part of some departmental plans in that report, such as health care, 1997-98, p.103).

(ii) Use by the genuine progress index of outcome-oriented measures.
For example, in assessing health care, the index will count the economic costs of sick days at work, and of changes in the rates of cancer, heart disease or respiratory illness and other actual health outcomes rather than inputs like government expenditures on health care. In other words, the index will measure in monetary terms, the costs of many of the outcomes already used in *Government by Design.*

(iii) Ongoing discussions with the Priorities and Planning Secretariat on potential cooperation and exchange of information. The Secretariat has already offered to issue the invitations for the inter-departmental consultation scheduled for March.

Goal Three: Design for Policy Relevance

The development of a sustainable development index for Nova Scotia is not an academic exercise, but is intended as a practical policy tool to assist in evaluating the benefits and costs of alternative development strategies. Although the initial construction of the index is laborious and time consuming, once in place it is designed for clarity of understanding and interpretation, simplicity of data entry and application, ease of use, continuity over time, and comparability with other jurisdictions. A primary goal of phase two is to ensure that these criteria are met.

The policy applications of a sustainable development index are described in chapter IV. Here it is sufficient to designate as an interim goal of phase two that the sectoral accounts become part of the practical information base for informed decision-making and policy planning in the relevant government departments.

The longer term goal is that the index become an essential component of the economic infrastructure of the new economy. It is widely recognized that full-cost accounting is a basic prerequisite for a successful sustainable development strategy. The index is intended as a major step in that direction.

Goal Four: Expanding Partnerships and Working Relationships.

It is a major goal of phase two to continue the constructive dialogue among provincial and federal government officials and policy planners, researchers, business interests and academic experts that was begun in phase one. This process of consultation is necessary to build consensus on the fundamental goals of the index, to deepen the understanding of economic, social and environmental linkages which the index reveals, and to ensure common understanding of the project's purpose and scope. The dialogue is also essential in order to solicit input and feedback at every stage in order to ensure accuracy, policy relevance and utility of the information.

The de facto project advisory council that now exists will also help with data sources, reviewing draft versions of the accounts, and advising on omissions and methodological problems. Several faculty members at Dalhousie and Saint Mary's Universities, the Atlantic region representative of the Bank of Canada, and several government officials have already agreed to review material in progress.

In phase two, this network of partnerships will be expanded to include departmental policy planners and experts to whom discussion papers will be presented at early stages of the sectoral account development and whose advice will be sought on various aspects

of the accounts. For example, working relationships on the Transportation Cost Analysis will be developed with members of the Department of Transportation and Public Works, on the forestry accounts with both Nova Scotia Natural Resources and with Forestry Canada, and so on.

In all cases, the accounting methods may be modified and revised in light of the feedback received before a final version is presented. The inter-departmental consultation planned for March, 1998 is a first step in what is intended to be an ongoing dialogue throughout phase two, both on the index and on sustainable development strategies.

Above all, it is a central goal of phase two to continue and expand the constructive working relationship that has developed with Statistics Canada. For example, a visit to Ottawa is planned by the project director for June 1998, to review work on the natural resource accounts with Mr. Robert Smith and other members of Statistics Canada's environmental staff as well as with Ms. Ann Kerr and other members of Environment Canada's indicators branch.

Mr. Hans Messinger, of Statistics Canada's Input-Output Division, will continue to make periodic visits to Halifax to work with the project, and he is already planning an extended stay here in the middle of 1998. By early December, 1997, special arrangements had been made for personnel and materials assistance from Statistics Canada's regional office, and this partnership will evolve into an ongoing working relationship during 1998.

Another potentially fruitful partnership may be with the new membership of the Nova Scotia Round Table on the Environment and Economy, to be announced shortly. A progress report on the sustainable development index will be presented to the new Round Table when it convenes in the coming months.

Goal Five: Methodology Revisions

In the course of the work so far, we have encountered major methodological and data collection challenges that must still be resolved. These involve the complexities of tracing economic, social and environmental linkages, the difficulties of assigning monetary values to non-market variables, gaps in data availability, definitional ambiguities on categories such as defensive expenditures, and the uncertainties inherent in estimating the future benefits and costs of current actions.

Despite these obstacles, all those associated with the project are convinced that there are great potential benefits to proceeding at this stage with the pilot application of the sustainable development index to Nova Scotia, even though some of the difficulties remain unresolved.

It is therefore an important goal of phase two to modify, revise and improve the valuation methods described in chapter II (3) in light of our developing experience. One of the major purposes of the index is also the identification of data gaps and the recommendation of areas for further research, data collection and investigation. The index must always remain a flexible tool open to continuous improvements in methods of valuation, advances in knowledge and data availability.

One methodological goal in the development of the sectoral accounts is to use several different methods of valuation for a single variable, wherever possible, in order to test the degree of correlation and accuracy of alternative measurements.

One of the major vehicles for methodology revision will be the advice received from departmental policy planners and experts in response to the draft accounts and discussion papers presented to them in the development of each set of sectoral accounts listed in goal one above. Officials will be asked to review and comment not only on the data and results, but on the valuation methodology itself, and to suggest additional, alternative or revised methods which will be taken into account in the final accounts.

In the meantime, it is necessary to move forward in the face of uncertainty, simply because it is much more accurate and conservative to *include* known but uncertain costs such as natural resource depletion, than to set their value at zero, as the GDP does and which consistently underestimates total costs. In practice, exclusion of non-market and indirect costs frequently leads to serious social and environmental damages, as the region knows from the experience with the collapse of the groundfish stocks.

As Professor Richard Ottinger, an expert in environmental costing, reported to the OECD,

> *A crude approximation, made as exact as possible and changed over time to reflect new information, would be preferable to the manifestly unjust approximation caused by ignoring these costs, and thus valuing environmental damage at zero.*

("Incorporating Externalities - The Wave of the Future," in Expert Workshop on Lifecycle Analysis of Energy Systems, (1993), OECD, Paris, p.54; Transportation Cost Analysis (1997), p.1-8).

Although individuals, businesses and society often face uncertainty when assessing benefits and costs, economic analysis frequently ignores costs that are difficult to measure and quantify, even if they are clearly comparable in magnitude to other costs. By contrast, our goal in phase two is to identify and make explicit such costs, to acknowledge clearly the existing uncertainties, to make cost estimates based on the best available information, and to explore the methods to improve valuation techniques and data sources.

Goal Six: Inter-Provincial Conference:
Expanding the Scope and Relevance of the Index, and Creating Long-term Benefit for N.S.

In March, 1998, an inter-departmental consultation will take place in Halifax, as described in the previous chapter. Later in 1998, Statistics Canada is planning to host an inter-provincial conference in Ottawa where a progress report on the Nova Scotia sustainable development index will be presented to federal and provincial representatives from throughout the country. Statistics Canada has already identified officials in British Columbia, Alberta, Manitoba and Ontario with expertise and a particular interest in the development of a sustainable development index, who will be invited to the conference.

The purpose of the meeting is to explore the applicability of the Nova Scotia model both at the federal level and in other provinces. One goal for phase two, therefore, is the preparation of a report for that conference with recommendations on methods for wider application of the index.

One concern will be that both federal and provincial jurisdictions develop indicators and appropriate methodologies to allow for easy comparability of progress between provinces. In other words, we will have to be measuring the same things if we want to compare ourselves with others. The Ottawa conference may be able to reach agreement on certain common indicators and methods of valuation.

In the long-term, there are other potential benefits that may arise from Nova Scotia taking the lead in this enterprise. By the end of phase two it may be possible to envision a training program here for representatives from other parts of the country who are interested in applying a sustainable development index to their own regions. The experience we will have gained in researching materials, collecting data, applying methodologies and designing for policy relevance will be useful for other jurisdictions in the process of adjusting their economic infrastructures to the requirements of the "new economy" of the 21st century.

In the even longer term, there are considerable economic benefits possible if Nova Scotia becomes a crucible for sustainable development strategies. It is, therefore, a goal of phase two to keep in mind the relevance of the Nova Scotia study for the rest of the country and beyond, and to reach the stage by the end of phase two that the "pilot project" begins to become an actual "working model".

Aside from the inter-provincial conference planned for Ottawa, the province could take its own steps in expanding the scope and relevance of the work by presenting the project to the Council of Maritime Premiers. In anticipation of potential regional cooperation and applicability, an interim phase two goal is to file and maintain comparable data for at least the other three Atlantic provinces, when available.

Goal Seven: Educational, Heuristic and Ethical Purposes

Because the index is an integrative mechanism designed to draw attention to social, economic and environmental linkages, it is an outstanding heuristic device to demonstrate the interdependent nature of reality. Even though monetary valuations of non-market values are necessarily imprecise, they function as an extraordinary educational tool to draw attention to the environmental and social impacts of economic activity and the subsequent economic impacts of social and environmental factors. Since money is a central organizing principle of life and society, it uses that very device to draw attention to larger issues.

In this way the index encourages a bigger view and longer-term thinking than we are normally accustomed to, and provides a framework within which to evaluate the effects of everyday actions, behaviour and policy. It encourages the incorporation of concrete benefit cost analysis into decision-making at all levels by emphasizing the unintended and unexpected consequences and effects of unconsidered actions, and it provides a practical tool to take timely remedial action to improve policy outcomes, at the individual, organizational and government levels.

Recognizing the limitations of narrow specialization which obscures social, economic and environmental linkages, the index encourages a multi-disciplinary cooperative task force approach to the solution of practical problems. Because it uses monetary analysis, the index is also a communication tool between conventional economists and the requirements of the "new economy", and between economists and environmentalists. It encourages specialists in separate disciplines to seek common ground and mutual understanding.

Perhaps most importantly, as an educational tool, the index brings together ethical and practical realities by encouraging a sense of responsibility for current actions and concern for the well-being of future generations. Social responsibility and care for the environment are also encouraged by the emphasis on sustainability thresholds determining the scale of human activity that the encompassing ecosystem can

accommodate. In fact, the index implies that our own interests are best served by attention to the well-being of the larger society and environment, and it thus helps overcome the sense of narrow isolation and alienation that often accompanies an individualistic, competitive culture.

In fact, the index views human economic activity according to a three-fold logic that is helpful for educational purposes and brings together the natural and social sciences in a meaningful way. It begins by assessing the scientific reality of the larger picture —for example the atmospheric carbon balance, the food chain cycle and natural reproductive rates of fish species, the soil health requirements for crop productivity, the relationship between human health and environmental impacts, and so on.

Then, as a second step, the analysis considers the extent and type of human activity that can be harmoniously accommodated by and within that scientific reality. For example how much and what type of fishing can be reasonably accommodated without destroying the resource on which society is dependent? What types of silviculture and soil conservation techniques are necessary to ensure resource health for future sustainability? What types of preventive health care or social investments can enhance well-being and social harmony?

Finally, having established the larger context, the third policy-making step determines how shares in economic activity are to be distributed and divided efficiently and fairly, a process that encourages democratic community participation. For example, once a sustainable level of fishing has been determined in accordance with the first two steps and criteria described, policy makers and affected stakeholders and communities can more rationally work together to determine the appropriate number of fishermen and type of boats that can secure the maximum sustainable economic return from the fishery. It might then be determined that a certain number of fishermen might be more appropriately re-trained and new investments in alternative economic activities encouraged to prevent excess resource depletion.

It should be noted that our current standard approach, reflected in the GDP approach to accounting, is precisely the reverse of the three-fold logic described above. We have generally begun with the allocative task in step three, by individuals maximizing their own return with a short-term time frame reference, and then only later dealt with the environmental and social costs and consequences of those actions.

Fortunately, recent decades have provided ample evidence of the inevitable policy failures of short-term lack of strategic planning, so that there has been a marked shift in both the policy and social arenas to acceptance of the need for new and more responsible thinking based on a bigger view of the interdependent nature of reality. The development of sustainable development indices simply reflects that new realization and understanding.

Finally, as an educational and heuristic tool, the index also encourages a sane attitude towards scientific knowledge altogether and helps clarify the relationship between information and understanding which is so often blurred in the computer age. Because the index frankly incorporates uncertainty and acknowledges the imperfection and limitations of our current state of understanding, it encourages humility in expressing findings and conclusions, openness to new data sources and improved valuation methods, and a striving for further research and better information. This is in marked contrast to a reliance on illusory, simplistic and uni-dimensional performance measurements which obscure significant portions of reality.

Interestingly, we have discovered that an index of sustainable development is able to acknowledge the extraordinary complexity of an interdependent world with its infinite social, economic and environmental linkages, while at the same time remaining aligned with ordinary common sense and human experience. For that reason, the index is a valuable tool to integrate and communicate complex realities in an understandable way.

2. Work Plan and Time Line

In order to realize the specified goals, the schedule for phase two is divided into fifteen tasks to be accomplished over a 15-month period, from January 1998 to March 1999. Draft interim accounts and discussion papers will be presented to relevant departments during each task, and final interim reports will be completed after the completion of each task. The framework for a comprehensive sustainable development index and a summary report of the project as a whole will be presented at the end of Phase Two, but each task should, in effect, be seen as a mini-project in itself, producing a sectoral account for each area examined.

NOTE: A Phase Activity Chart is attached at the end of this report.

The tasks are organized around the priority indicators selected and listed in goal one above. The methodology for each task is described in chapter II (3) (C) (vi) and (vii), which should be read in conjunction with the section that follows.

Each of the substantive sector-specific tasks will involve a process of:
* data collection, compilation and analysis;
* application of the appropriate valuation methods for each sector;
* preparation of a draft set of accounts with accompanying discussion papers detailing both conclusions and unresolved issues;
* consultations with relevant department officials, researchers and advisory council members;
* further research, revisions and modifications based on these consultations;
* preparation of a final set of accounts, with conclusions, substantive recommendations and analysis for policy relevance, including comparability with other jurisdictions;
* identification of data gaps, valuation uncertainties and recommendations for further research.

The schedule will necessarily be flexible and several of the tasks will overlap. For example, while awaiting a response from departmental officials reviewing a first draft and discussion paper on one set of accounts, data collection will begin on another set.

In addition, there will be delays as Statistics Canada needs time to reconstruct some provincial data from the original unpublished micro-data files, frequently a painstaking task. At those times, data collection in other areas will also proceed. This has already occurred. As Statistics Canada is currently searching for provincial statistics needed for valuations of the unpaid work sector, leisure time, and the costs of crime, we are proceeding with our own data collection for the forestry accounts and the transportation cost analysis.

Once the information needs of the sustainable development index are known and the index is actually in operation, such Statistics Canada data can be made available to the province as it is collected, making future data entry much easier and quicker.

Another reason for task overlap is the team approach of the study. Aside from our core research staff, we are working with and relying on data source input from many partners and consultants. The accomplishment of each task will also depend on their schedules and time availability. For example, Mr Mark Anielski at the Alberta Treasury was recently kind enough to send information and answer 35 detailed questions on the methodology and data sources for the forestry accounts. His replies were spread over four weeks during which time we proceeded with data collection in other areas.

At the same time, actual accomplishment of the tasks for demonstration purposes is a priority. Therefore we shall not delay any given task unduly due to data gaps, but produce the accounts with the best available data on a regular schedule, noting any information gaps, and filling in the missing data as it becomes available.

It should also be noted that with the exception of the first part of goal six, which has a time-specific reference in relation to the planned inter-provincial conference in Ottawa, all other objectives described above are being pursued simultaneously within each task. Therefore, the goals listed above actually form a set of criteria for the evaluation and accomplishment of each task.

The outputs of each task listed below will include specific calculations and data disaggregations, to make each set of accounts as policy relevant as possible. Thus ratios will be established between particular types of investment and corresponding estimated welfare gains or cost savings derived from the accounts, in order to demonstrate the cost effectiveness of alternative policy strategies. Examples are given in task two below only, for illustration purposes, but it should be understood that this is a specific objective of each task listed below, in fulfillment of goal three (above).

Finally, since there is a natural continuity between the foundation created in phase one and the actual operationalization of the accounts in phase two, many of the tasks and associated methodologies have already been described in chapter II. Therefore they are simply presented in summary form in this section.

Sequential order of tasks

The tasks described below are divided into five major sequential parts:

* Stage 1. Task One is the transition from Phase One to Phase Two, and lays the groundwork for the consultation process that is key to the completion of the other tasks.

* Stage 2. Tasks Two through Seven constitute the development of the representative sample accounts that form the basis of the sustainable development index.

* Stage 3. Task Eight is a significant progress benchmark for the project and presents the representative accounts to a federal and inter-provincial conference in Ottawa.

* Stage 4. Tasks Nine through Thirteen are the development of further accounts based on the representative samples in stage 2, and also the delineation of some indicators that can be included in a sustainable development index at a later stage of development.

* Stage 5. The completion stage of the project includes the aggregation of the sectoral accounts into a composite index of sustainable development (Task Fourteen), and presentations and workshops on the entire project for sustainability of the index itself and to lay the ground for wider application of the index outside the province (Task Fifteen).

The determination of the representative sample of different types of accounts and methodologies on which an index of sustainable development is based (Tasks Two through Seven), has been a major criterion in determining indicator and task priority. Thus, for example, rather than developing several natural resource accounts early on (forestry, fisheries, soil, non-renewable resources), we have chosen just one (forestry) to begin with, and left the rest until the other types of relevant accounting procedures are tested.

The inter-provincial conference (Task Eight) therefore represents the stage at which the most important component parts of the genuine progress index will have been field tested. Following that conference, the other sectoral accounts will be developed. The first eight tasks, and tasks 14 and 15, are therefore relatively definite. But tasks nine through thirteen are dependent on the experience of the first eight, and are subject to change.

Task One: Inter-departmental Consultation: March, 1998

The outline of the full day consultation is described in the progress report in Chapter II (5). The actual organizational tasks for phase two are as follows:

a) Before the Consultation

* Convening and organizing the planned inter-departmental consultation scheduled for March, 1998, including both substantive and procedural tasks:

    * preparation of background information material for all participants;
    * consultations with the Priorities and Planning Secretariat and officials in the Departments of Economic Development and Tourism, and Environment, both on the invitation list to provincial and federal policy planners and officials, and on the conference agenda;
    * preparation of final agenda,
    * preparation, with Statistics Canada on presentations, overheads and written materials for the morning session;
    * work with Statistics Canada on preparation of GDP component categories for re-classification in afternoon session and on work sheets for that exercise;
    * discussions with consultation facilitators on process, procedures and schedule of the event;
    * determination of venue and conference room set-up, tea and lunch catering arrangements, travel arrangements and accommodations for participants from Ottawa, and other procedural details.

b) Following the Consultation

* Debriefings, analysis of results and conclusions, follow-up meetings and discussions with individual participants, preparation and circulation of a final summary report with recommendations for future action and ongoing consultation processes.

Task Two: Accounts for Five Test Sectors

* Analysis of final data sets from Statistics Canada of requested material, in addition to the raw material already collected, on the five sectoral accounts begun in Phase One:
    * Unpaid work sector: household work;
    * Unpaid work sector: volunteer work;
    * Valuation of leisure time and length of work week changes;
    * Income distribution, including comparability studies based on

after-tax GINI coefficients;
* Costs of crime and litigation.

* Application of valuation methods as described in Ch.II(3)(C);

* Completion of draft time series, graphs and indices based on raw material already collected in phase one plus new material expected from Statistics Canada in January 1998; and preparation of discussion papers;

* Consultations with Departments of Finance, Justice, Labour, and Human Resources as appropriate, with Dr. Andrew Harvey of Saint Mary's University's Time Use Research Centre on the valuations of unpaid work and leisure time and with Statistics Canada researchers and managers, including especially members of the Canadian Centre for Justice Statistics and *Juristat* staff;

The main outputs of task two are:

* Review and revision of accounts and valuation methods in light of consultations and feedback; preparation of final accounts, conclusions, recommendations and identification of data gaps and directions for further research.

* Aside from the five sets of accounts, there are two other derivative outputs of task two:

a) From a combination of the first four sets of accounts —household and volunteer work, leisure time, and income distribution, —in addition to some basic data on the paid workforce, it will be possible to derive an index of women's changing role in the workforce.

b) From the costs of crime and litigation, an estimate will be derived of the average per unit cost of crime for different categories of crime -- homicide, violent crime, property crime, juvenile crime, fraud, etc. From that, a ratio will be established to correlate the unit dollar saving to society per unit decrease in the crime rate for each category In this way policy makers can estimate the productive capital freed up for direct investment in welfare improvement for every percentage drop in the crime rate.

In addition the costs of crime will be disaggregated in order to show the most cost effective areas for investment in crime prevention. In other words, every dollar invested in a particular type of crime prevention will produce a different yield in cost savings. For example, what are the effects of investment in burglar alarm systems on the rate of break-ins and burglaries, or the effect of drug abuse programs on the rate of drug-related crimes, and what are the corresponding ratios between investments and cost savings?

As noted, these examples are given here for illustration purposes only to demonstrate the calculations that will be made throughout the index to make each set of sectoral accounts as policy relevant as possible. For each task below, data disaggregations and cost effectiveness ratios between particular investments and anticipated welfare gains will be calculated from the accounts in order to evaluate alternative policy strategies.

* Review of experience with the five test sectors with Statistics Canada and with various members of the project advisory council, and delineation of guidelines for work on other sectors based on this experience.

Task Three: Forestry Accounts

Priority Assignment

The forestry sector has been selected as the pilot test study for the application of natural resource accounting methods to Nova Scotia, for four reasons:

a) the importance of the forestry sector to the Nova Scotia economy;

b) potential immediate policy relevance, especially in light of the urgency of the recent National Round Table report on Maritime Woodlot Management recommendations to incorporate sustainability criteria in the financial accounts;

c) the availability of good models for forestry valuation methods, both internationally and in Canada. These include the Asian Development Bank's extensive compendium of monetary value estimates for forest services; Statistics Canada's Monetary Timber Asset Account and the Norwegian forestry accounts; an OECD report translating acid rain damage to eastern Canada forests into monetary terms; several studies using travel cost methods (TCM) and contingent valuation (CV) analysis to determine forest recreation values in dollar terms; and the willingness of Mr. Mark Anielski of the Alberta Treasury to share his seven years of expertise in compiling Alberta's timber and forest carbon accounts and forest sustainability index;

d) the existence of a clear set of indicators and criteria produced by the Canadian Council of Forest Ministers, setting the parameters for Canadian sustainable forestry policy, and providing a definite set of standards and targets both for this study and against which to measure the Nova Scotia forestry sector.

Specific tasks for this natural resource accounting case study:

* Identification and delineation of timber and non-timber forestry values, including:
 - merchantable proportions of timber, including age, species, composition and market value factors;
 - watershed protection;
 - protection against soil erosion;
 - carbon sink functions;
 - tourism and recreation values;
 - air quality and climate regulation;
 - biodiversity and wildlife protection.

* Specification of standards, targets, policy goals and sustainability criteria, including maximum sustainable yield / maximum economic return models, and other optimum objectives against which to measure progress;

* Data collection, compilation and analysis from the Nova Scotia Forest Production Surveys, the Compendium of Canadian Forestry Statistics, and from many other sources, including those listed in the attached sample bibliography, section 3: Forestry;

* Application of valuation methods; classification of forest values into direct and indirect (proxy and extrapolated) valuations, and non-monetary valuations as described in ch.II(3)(C); and construction of draft forestry and carbon sink accounts by age and species dimensions if possible; preparation of discussion papers on the findings;

* Consultations and evaluations of measurements, valuations and methodologies with N.S. Department of Natural Resources and Forestry Canada officials, and with other researchers, consultants and advisors, including Mr. Anielski from the Alberta Treasury

and Dr. Bill Freedman of Dalhousie's Biology Department; review and revision in light of inputs and feedback.

Task Three Outputs:

* Final accounts, report, conclusions, policy recommendations, identification of data gaps and methodology weaknesses, as in Task Two outputs above. Cost effectiveness calculations of different harvesting practices for policy relevance.

* Review of the forestry study with Statistics Canada's environmental staff and with members of the project advisory council for its implications for other natural resource accounts.

Task Four: Transportation Cost Analysis

This task has been assigned priority for several reasons:

a) Transportation analysis is a powerful integrative tool, demonstrating linkages between economic, energy, environmental, social and quality of life criteria, and allows a life-cycle cost analysis from production inputs through consumption and use valuations, to waste disposal costs. It is therefore an excellent case study of the issues involved in tracing and valuing these linkages, while at the same time having the advantage of a comprehensive sectoral basis with direct relevance to a particular government department.

b) The subject has direct practical policy relevance for Nova Scotia's participation in Canada's commitment to reduce carbon dioxide emissions through fossil fuel combustion; for pollution abatement issues; and for ongoing policy decisions on road and highway construction, mass transit investments, energy policy and other important issues.

c) The analysis incorporates three separate indicators out of the 26 included in the original Genuine Progress Index -- the services of roads and highways (positive investment), the costs of commuting (intermediate expenditure), and the costs of automobile accidents (reduction of welfare)-- and has links to the climate change and air pollution cost indicators as well. It thus enables us to accomplish a significant proportion of the original GPI's tasks with a single comprehensive analysis.

d) In the course of an extensive literature review, we have located and obtained one of the most comprehensive models available -- the extensively documented September 1997 Transportation Cost Analysis: Techniques, Estimates and Implications of the Victoria Transport Policy Institute (VTPI) in B.C. The analysis is itself based on and integrates a very large number of other sources and previous studies and is extensively footnoted to allow cross-checking of references and methodologies. The Canadian, U.S. and European case studies mentioned in Ch.II (3) C (vi) g, above, will also be used.

We have reviewed the detailed and voluminous VTPI work to assess its applicability, and purchased the Institute's Transportation Cost Analyzer software package, which creates a data program for application and analysis by other jurisdictions. In short, we have a comprehensive and convenient methodology to which we can apply the Nova Scotia data.

e) Because the above methodology compares eleven modes of transportation, it contains a basis for comparability. Also because comparable data exists for British Columbia, Ontario and Alberta, the method has potential for inter-provincial comparability.

The specific tasks for this analysis include:

* Adaptation of the VTPI model to Nova Scotia. This will require some omissions, revisions and changes to accommodate Nova Scotia circumstances. In addition, we have already identified some methodological flaws which we shall attempt to correct, and some potential ways to increase precision, subject to data availability. In short, as with all methodologies, we shall apply the VTPI model with discrimination, noting recommended changes in the application to Nova Scotia.

* The work will follow the basic outline of tasks for the previous sections:
  - data collection and analysis, application of valuation methods, preparation of draft accounts and discussion papers;

- consultations and evaluations of measurements and methodology with officials in the Department of Transportation and Public Works, with Mr. Todd Litman, director of the VTPI, with Statistics Canada, and with other consultants and advisors; revision of the accounts.

Task Four Outputs:

* Final accounts, report, conclusions, recommendations, identification of data gaps and methodological uncertainties, and cost effectiveness ratios for alternative investment strategies in different modes of transportation. For policy relevance, data will be disaggregated, according to proportion of kilometres travelled, to calculate costs of commuting to work for different transportation modes. Critique of the VTPI model and review of the entire application and process.

Task Five: Ecological Footprint Analysis

This is an analysis of the ecological footprint (EF) and appropriated carrying capacity (AAC) of Nova Scotia production and consumption patterns. The model is described briefly in Chapter II, section 4 (B) (iii) (c), and the methodology in II (4) (C) (vi), above. As noted, this indicator ranked highest among those tested by Virginia Maclaren (1996) according to both general indicator selection criteria and capacity to measure sustainability. Comparability is enhanced by prior application to Canada and British Columbia.

The primary reason that ecological footprint analysis has been assigned high priority in this project is that it provides a very convenient and easy to understand overview of the overall environmental impacts of our provincial production and consumption patterns, with a strong basis for international and inter-provincial comparability. As such it creates a basic framework for the more specific economic-environmental-social linkages revealed by the sector specific natural resource accounts and pollution abatement cost analyses. Statistics Canada's new Material and Energy Flow Accounts (MEFA) provide an excellent data source for EF/AAC analysis and are strongly linked to this approach conceptually.

* Data Collection

The main challenge of task five is that very large quantities of data are required for the initial consumption - land use matrix on which the analysis is based. Land use equivalents are calculated for energy use, and for built, cultivated and forest land required for material and resource inputs for each category of products and services consumed, including foods, housing, transportation, and different categories of consumer goods and services, as classified in the national income and expenditure accounts.

A possible short-cut for our initial accounts, which would save enormous time in the very labour intensive data collection process, is simply to estimate the Nova Scotia share of the matrix for Canadian consumption patterns already constructed by Wackernagel and Rees (1996) at the University of British Columbia, according to both population and income share.

The basic assumption for such a short-cut, which may be tested for a few key variables such as energy, food, housing and transportation, is that Nova Scotia and Canadian consumption patterns vary in direct proportion to income differences. A second assumption, which is less problematic, is that the embodied energy and materials components of goods and services consumed in Nova Scotia are the same as that in Canada as a whole.

Therefore, before collecting any raw data for Nova Scotia, the national and provincial expenditure accounts will be examined to compare Nova Scotia consumption patterns of energy, food, transportation and housing with the Canadian average. If consistent ratios can be determined based on provincial and national income differentials, it is proposed that we assume equivalent ratios to apply to the different categories of consumer goods and to services (including education, health care, defence, financial services, and so on).

If this is the case, we propose to construct the Nova Scotia matrix initially by calculating the provincial share of the ecological footprint matrix already constructed for Canada, without at this stage collecting any separate data for the province. We shall assume that provincial idiosyncrasies producing higher than national rates of consumption in some categories (e.g. tobacco), are cancelled out by lower rates in others.

In this case we shall denote the fact that all measurements for this analysis are indirect, derived figures, according to the method described in Chapter II,(C)(iii), and will thus appear in normal type face. Clearly the model can be improved for accuracy in future years by making direct calculations for the province, at which time the matrix measurements will appear in bold type. This process could occur gradually, as described in II(C)(iii) above, as time permits, with a mixture of bold face (direct) and normal type (indirect) measurements.

It should be noted that once the basic consumption patterns are analyzed and the matrix constructed for the first time, it is then quite easy to track changes in the ecological footprint over time according to changes in different categories of consumption. This is potentially a very powerful tool for analysis of sustainability, since environmental impacts are mostly a direct function of production and consumption patterns. Increases in production efficiency or technological improvements to reduce environmental impacts could be built into the matrix by reducing the land impact ratios of particular categories of consumption.

While the short-cut method proposed is useful as a one-time demonstration of EF/AAC analysis, it suffers from the notable disadvantage that Nova Scotia progress over time cannot be compared with other jurisdictions if the provincial figures are derived from national data. This measurement failing would be particularly unfortunate if Nova Scotia adopts a deliberate sustainable development strategy which would eventually reduce the province's ecological footprint compared to other provinces. It seems important to track such progress.

The Material and Energy Flow Accounts themselves are the one component of the new Canadian System of Environmental and Resource Accounts that currently exist only at the national level. But Statistics Canada has definite plans to regionalize the MEFA to the provincial level. At that point direct measurements for a provincial EF/AAC analysis will be relatively easy. Consultations will be held with Statistics Canada's environment division to determine the extent to which Nova Scotia provincial data can be reconstructed from the current national accounts. Doing so according to the composition and mix of Nova Scotia industry relative to that of the country as a whole is one possibility for the adaptation of the national data to the province.

* Valuations

Since ecological footprint - appropriated carrying capacity analysis uses land equivalent units in hectares per capita, alternative methods will be examined to convert these measures into monetary units, since that is the basis of the Nova Scotia index, even though Rees and Wackernagel (1996) deliberately avoid doing so. To maintain the integrity of the original model, in light of the authors' reservations about the use of monetary units, the consumption - land use matrix will also be presented independent of any attempts at monetary valuation.

Extensive consultations with the U.B.C. authors and with Statistics Canada officials are planned on at least two alternative valuation methods proposed: a) average rural land value equivalents, and b) establishing correlations between equivalent land use consumption and income share. Other methods may be possible. Mr. Hans Messinger in Statistics Canada's Ottawa office is currently studying the ecological footprint model to advise on this issue.

* The remaining components of Task Five follow the pattern described for the previous tasks: preparation of draft accounts and discussion papers; consultations and feedback; review and revision; final accounts, conclusions, recommendations, identification of data gaps and methodological difficulties, calculations for cost effectiveness and analysis for policy relevance and alternative investment strategies; future directions.

Task Six: Valuations of Durability

This indicator, constituting two separate sets of measurements, is designed to calculate the quality of consumer durables in relation to their cost. The indicator of quality is the ability of consumer durables to provide services over time.

Therefore two time series are constructed to determine
a) changing prices of particular categories of goods in constant 1986 dollars, and
b) changing rates of depreciation for these categories, according to their durability.
For example, a television may cost more than it once did, but it also lasts considerably longer. The changing ratio between the two determines whether the consumer is getting more value for money. Adjustments must be made according to changes in the nature and type of service provided.

* Data Collection

Separate provincial data are not available for this category, and it is assumed that the ratio between consumer durable costs and services over time is equivalent for all the Canadian provinces. The geographical diffusion of technological innovation and change in consumer products is such that there are unlikely to be significant differences in durability and quality of goods by province.

Differing provincial sales tax rates, which do affect the ratio and the costs of consumer goods, are not, however, a function of differences in quality, durability or capacity to provide services, which is the purpose of this indicator, and they can therefore be omitted from the equation. Therefore, Statistics Canada national data will be used.

* Valuation Methods

Changing costs of durables are easy to track. It is more challenging to determine the changing rates of depreciation for different categories of goods and then to calculate an average aggregate rate of depreciation. The original GPI used a standard 15% depreciation rate in its calculations. Consultations with Statistics Canada researchers, however, have made clear that it is definitely possible to adopt the more precise method of differentiating rates of depreciation by category of goods. That improvement will make the measure far more relevant to consumers and businesses who can then distinguish changes in value for money over time in different expenditure categories.

Following the original GPI methodology, the cost of consumer durables is subtracted from the index, just as household accounts will deduct expenditures, and the services provided over time are added to the index. This approach is consonant with the basic purpose of the index in adding only those values that contribute to welfare and prosperity. In the case of consumer durables, that contribution to well-being is reflected in the services provided over time, not in the initial expenditures, as recorded by the GDP.

With the construction of time series for both costs and services, it will be possible to construct a third column of coefficients, with a higher ratio between services and goods implying greater value for money, and increased product quality. The original GPI did

not construct this third column, since it was primarily concerned with constructing the aggregate index for all factors and a subsequent composite bottom line to compare with the GDP. Since our purpose is to make a meaningful statement about each indicator, this third column will be a necessary component here to assess value and quality, even though it is not relevant for the final index.

* The remaining tasks follow the standard pattern: draft accounts and discussion papers; consultations with officials in Business and Consumer Services, Finance and Statistics Canada and with local economists, including Dr. Lars Osberg at Dalhousie University; and review and revision of methodology and measurements.

Task Six Outputs

In addition to the normal task outputs (final accounts, conclusions, recommendations, policy analysis, data and methodology observations, and review), a little more creative license will be employed in this section than in others, because of the direct relevance of this indicator to consumer lifestyle patterns.

Therefore in assessing the ratio of costs to services of consumer durables, an attempt will be made here to integrate "intermediate expenditures", as defined in chapter II(5)(b)(vi) above, in the costs of durables. It will not be possible to integrate these intermediate costs in the original data collection for costs of consumer durables, since they are not integrated in the Statistics Canada data. Therefore, they will be included here for select items, as an illustration of the effect of full-cost accounting on the value of services provided.

In one creative example from the literature review, Ivan Illich includes intermediate expenses in the operation of an automobile in the United States to determine the number of hours the average American spends involved with his car. He adds actual time spent driving, filling up with gas, taking the car to be serviced, looking for parking spaces, shovelling the driveway, scraping off windshield ice, etc. and then adds costs of repairs, servicing, insurance, registration and car payments to calculate the number of hours the average American works to support his car. He adds all these hours together to determine the "full cost" of owning a car in annual hours expended, and divides the total by the average number of miles driven in a year (the measure of actual "services" provided by the automobile). This corresponds to the ratio between the costs and services of consumer durables when intermediate costs are factored into the equation.

Not surprisingly, Illich discovers that the average American is driving a lot "slower" than he thinks when all the "intermediate" expenses are converted into hours. In fact, when the social costs of environmental and other impacts of the automobile are added to the intermediate expenses which the owner personally bears, Illich determines that the average American is driving considerably slower than a bicycle, which includes far fewer intermediate expenses.

The outputs for task six, therefore, will include a few illustrative examples demonstrating the ratio of services to costs of selected consumer durables when intermediate expenses are included. No substantive claims of precision are made for these illustrations, and intermediate expenses cannot at this stage of analysis be included in the accounts themselves. But they are valuable in demonstrating both the purpose of assessing the value of services provided by consumer durables and the issues raised in moving towards full-cost accounting.

These examples are also relevant to daily consumer choices, and could be included here simply as a form of "consumer education" designed to draw attention to a bigger picture with more complex cause and effect interactions than are apparent in normal shopping. When global trade issues are included, such as labour, environmental and safety standards in the countries of origin of imports, yet another dimension is added to the ratio between costs and services of consumer durables.

In fact, a significant difference between the outputs for Task Six and all the other tasks, is that the "policy relevance" criteria for this indicator refer particularly to individual consumer choices rather than to government policy. At a later stage it might be possible to envision the incorporation of quality valuation techniques into taxation and tariff policy, with incentives and penalties assessed according to durability and other criteria for sustainability. Paul Hawken, for example, has proposed a "most sustainable nation" tariff in which preferences would be given to imports produced sustainably abroad.

But these may be distant prospects. In the meantime, "value for money" calculations in relation to consumer durables, as assessed by this particular indicator, remain almost entirely individual market-based decisions. For this reason, the outputs are best conveyed in a form that will be helpful in advancing consumer awareness. More informed shopping at the grassroots level may itself be a significant step towards the incorporation of full-cost accounting methods in government policy.

Task Seven: Costs of Atmospheric Emissions

This task includes the completion of accounts for two sets of indicators:

a) Costs of air pollution,

This variable will use trends in ambient air quality indices as the scientific data base. As with the costs of crime (above), the goal, after completion of the valuations and accounts, is to produce a basic ratio between unit changes in ambient air pollution and costs, so that policy makers can, in a simple way, determine the cost savings of each percentage improvement in levels of particulates, nitrogen dioxide, sulphur dioxide and other emissions.

The Asian Development Bank's compendium of monetary value estimates for air resources from a wide range of literature will be used as a starting point to reference more detailed valuation methods (Economic Valuation of Environmental Impacts: A Workbook, 1996). Other useful sources include several studies in J.J. Mackenzie and M.T. El-Ashry, (eds), Air Pollution's Toll on Forests and Crops, (1989), Yale University Press, New Haven, and J.S. Cannon, The Health Costs of Air Pollution: A Survey of Studies Published 1984-1989 (1990), American Lung Association, Washington, D.C.

Among the air pollution costs estimated in these and other studies are:
- damage to agricultural vegetation
- materials damage;
- clean-up costs;
- acid rain damage (aquatic and forest);
- urban disamenities;
- aesthetics (using both the Workbook's recreation value estimates for the U.S. and Europe, and provisional contingent valuation methods);
- health costs.

b) Carbon Dioxide Emissions

Since carbon dioxide is not a "pollutant" it is considered separately. In addition, this set of calculations is concerned with one very particular type of impact -- the effect of CO2 emissions on climate change, and the estimated economic costs of such climate change. While the basic "condition-stressor-response" model of evaluating environmental impacts is a helpful framework for straightforward cost estimates in both sets of atmospheric emissions accounts, an additional "sustainability index" will be suggested for the carbon accounts.

Dr. Bill Freedman's Environmental Ecology (1994) calculates the earth's natural excess carbon absorptive capacity over natural emissions. Consultations with Dr. Freedman, of Dalhousie University's Biology Department, indicate that it is possible to use this margin to estimate the quantity of additional human carbon emissions that can be absorbed without increasing the cumulative atmospheric stock of carbon dioxide. This would be the "sustainability threshold".

Using the "precautionary principle" of incorporating the uncertainty of predicted climate change, as described in chapter II(3)(C)(v) above, the greater the deviation from this threshold, the higher would be the cost estimates. From these figures, it will be possible to determine the degree to which current Nova Scotia levels of carbon dioxide emission are "sustainable". Movement towards

this sustainable threshold is the equivalent of deficit reduction towards a balanced budget. To reduce the debt principle itself, further emissions reductions would be necessary to reduce excess stock levels as a result of previous accumulations.

Corresponding cost estimates for this model can be calculated using economist William Cline's discounting of future costs of global warming at very low rates of interest (Global Warming: The Economic Stakes, 1992). In this way, the present value of future costs is incorporated into a set of accounts that balances the costs and benefits of current fossil fuel energy consumption, which is the principle cause of human carbon dioxide emissions. Other sources are cited in Ch.II (3) C (vii) c.

The final monetary value of this set of accounts can be thought of as the amount of money that would have to be accumulated to compensate future generations for the long-term costs of current levels of energy consumption. A simple analogy would be to calculate the amount of money that would have to accumulated to compensate future generations for the debt service charges they will pay as the result of debt incurred to finance the present generation's levels of consumption. This set of accounts therefore meets the sustainability criterion of incorporating inter-generational equity.

The dollar economic costs of global warming, based on the rate of climate change estimated by the Intergovernmental Panel on Climate Change (IPCC), have been estimated by Cline, Nordhaus and many other economists. A recent study (November, 1997) commissioned by the Canadian energy industry, estimated a $70 billion cost to that industry by the year 2030 as a consequence of reducing carbon dioxide emissions to 1990 levels by 2010. The various estimates for Canada and the United States will be examined to determine the Nova Scotia "share" of such costs for various levels of emission reductions, using the recent Kyoto treaty standards as the base.

c) We have not yet found a successful way to calculate the Nova Scotia share of the costs of stratospheric ozone depletion. Despite its flaws, we shall use the original GPI valuation method for demonstration purposes only in the event that we are unable to find a better model in the coming months.

* The same guidelines will be applied to these sets of accounts as in the previous tasks: data collection; examination and application of valuation methods; preparation of draft accounts and discussion papers; consultations with Environment and Natural Resources officials and with members of the project advisory council; review and revision of the accounts and methods.

* Outputs for task seven will include:

- separate cost estimate accounts for Nova Scotia for air pollution and for carbon emissions from fossil fuel consumption;
- ratios of cost savings in proportion to specific emissions reductions for different types of air pollutants;
- graphs of current Nova Scotia energy consumption levels in relation to the sustainable threshold estimate; and
- graphed estimates of costs to Nova Scotia of different rates of carbon emission reductions.
- a summary chart of Nova Scotia's share of the costs of stratospheric ozone depletion will be included.

Conclusions, recommendations, analysis for policy relevance, identification of future data collection and research needs, and a process review, will follow the format of previous tasks.

Task Eight: Inter-provincial Conference on GPI, Ottawa

Tasks two through seven provide a representative sample of the different types of accounts and methodologies on which an index of sustainable development are based. Thus task eight -- the presentation of a progress report on the Nova Scotia pilot project to federal and provincial representatives with a view to wider application-- is a significant benchmark in the development of the province's sustainable development index.

Other natural resource accounts (soil, fisheries, non-renewable resources), other environmental impact assessments (water quality, ozone depleting substances, etc.) and other social accounts like health care and education can then be constructed on the basis of the representative models tested and revised in tasks two through seven.

The inter-provincial conference in Ottawa has been proposed by Statistics Canada and will be hosted by that agency. It is tentatively planned for early October, 1998. Prior to the conference, there will be presentations to the Canadian Economics Association in Ottawa in June and to the Canadian Centre for the Study of Living Standards in September. Feedback from both presentations will assist in preparations for the conference.

Participants will include federal and provincial officials from several departments with a direct interest in and connection with socioeconomic and environmental indicator projects, expanded economic accounts, sustainable development infrastructure, and appropriate statistical methodology. It is also proposed to invite experts from academia, like Tony Hodge at the University of Victoria, from research institutes like the International Institute for Sustainable Development in Winnipeg, and from municipal indicator projects like the Regional Municipality of Hamilton Wentworth and the Edmonton Social Planning Council, as well from the national and provincial Round Tables on the Environment and the Economy.

The principal purpose of the conference will be to investigate the wider application of the Nova Scotia pilot project at the federal and provincial levels, and to explore the development of common indicator methodologies with a view to comparability of data results. Issues of data availability, methodology and policy relevance will all be discussed, and the conference is seen as the first step in the creation of an ongoing network for federal - provincial cooperation in the development of indices of sustainable development.

Specific tasks for task eight include:

* Review of progress to date in all research areas in consultation with Statistics Canada personnel and with key members of the advisory council;

* Preparation of a draft report for the inter-provincial conference; and circulation of the sectoral parts of that report to the key departmental officials who consulted on those sections, to ensure that the summary reporting reflects the main issues of importance;

* Revision of the report in light of consultations, and preparation of final report for presentation to the conference;

* Preparation of summary background materials to be distributed to participants in advance of the conference;

* Preparation of agenda for the conference in consultation with Statistics Canada, Ottawa;

* Detailed procedural and practical arrangements;

Conference Outputs:

* Report of conference proceedings, conclusions and planned actions to be prepared and sent to participants;

* The creation of an actual working network for continued ongoing cooperation among conference participants;

* Identification of other key partnerships and potential working relationships by conference participants, and initiating process of updating and briefing those officials and individuals;

* Preparation of summary brief on policy relevance of the entire initiative for legislative leadership at both federal and provincial levels;

* Coordination with other relevant initiatives at federal and provincial levels, including outcome measures initiatives, Round Table projects and environmental indicators reporting;

* Establishment of a mechanism and framework within Nova Scotia for hosting and training representatives from other provinces and at the federal level who wish to study the Nova Scotia pilot project in more depth and detail;

* Recommendations on methods for beginning to incorporate sustainable development accounting within existing economic accounting systems and existing Statistics Canada studies, in order to draw attention to economic-social-environmental linkages.

* Summary of specific policy recommendations that flow from the work to date.

Tasks Nine - Thirteen:

The following tasks are not outlined in detail, partly because the methods employed will flow from a review of the entire process to date and from the use of the methodologies tested above, and also because work is still under way in these areas to determine appropriate methodologies. The basic format and sequence of steps will be the same as in the previous tasks, and are not repeated here. In summary form, therefore, the tasks are:

Task Nine: Natural Resource Accounts

The natural resource accounting methods of task four will be reviewed and their applicability assessed for other natural resource accounts. Necessary revisions and modifications will be made, and stock and flow accounts will then be compiled for other resources Additional sector-specific valuation methodologies will also be used, as described below.

a) The Fisheries Accounts

These accounts will utilize the World Resources Institute model for Coast Rica, tracking the maximum economic return against the maximum sustainable yield for each species, as described in Ch.II(3)(C)(vi) above. There will be consultations with DFO scientists, officials in the Nova Scotia Department of Fisheries and Aquaculture, Prof. Tony Charles at Saint Mary's University and with other experts.

b) The Soil Accounts,

These accounts will use the U.S. Department of Agriculture's Erosion Productivity Impact Calculator (EPIC). There will be consultations with Department of Agriculture and Marketing officials and with experts at the Nova Scotia Agricultural College in Truro. We are very fortunate to have the expert assistance of agroecologist and soil specialist Jennifer Scott in the development of these accounts.

For the stock accounts, both topsoil and farmland conversion will be considered. Monetary estimates for Nova Scotia have been made by Jacques Whitford consultants for productivity losses due to erosion. Loss of farmland to urbanization in Nova Scotia is recorded over time, with costs assessed according to the value of agricultural output per acre of converted land. This data is available from the new Statistics Canada Land Account in the Natural Resource Stock Account.

The flow accounts will use the EPIC methodology, and will help to measure the sustainability of current agricultural practices. Unsustainable practices would, in effect, convert capital to current income. Thus, soil conservation measures will be counted as positive investments in natural capital while soil degradation is regarded as a negative flow. For example, U.S. monetary estimates exist for soil damage due to compaction by heavy machinery, and these can be extrapolated for Nova Scotia in proportion to the use of such machinery in the province, with appropriate adjustments for soil type.

As with forestry, soil deterioration may not immediately show up as declining yields. For example, it is estimated that 50% of fertilizer use in North America today compensates for soil erosion and thus masks declining soil quality. Thus half of fertilizer use does not produce an actual net increase in productivity, even though the GDP counts 100% of fertilizer sales as economic growth. For this reason we shall use actual measures of soil quality as better predictive measures of long-term agricultural sustainability than the changes in yields recorded by the GDP.

c) Nonrenewable Energy Resources

This category differs from renewable resource accounts in so far as only stock accounts are really relevant. Or, it could be said, there is in effect a one way flow -- capital stocks can only decrease. From this perspective, there is no such thing as a "sustainable" use of nonrenewable resources, by definition.

In the literature, there appear to be two main ways of dealing with this dilemma and we shall try to use both in these accounts. First, the ratio of energy outputs produced from a given amount of energy inputs can be calculated over time. If this ratio remains relatively constant, then it might be argued that resource use is relatively sustainable, at least from a human economic point of view, even though stocks are declining absolutely. If, on the other hand, the amount of energy produced from a given expenditure for exploration, extraction and processing declines over time, then the measure indicates declining economic sustainability.

The second method has practical policy relevance. Several ecological economists have argued that sustainability is measured by matching nonrenewable resource extraction with equivalent investment inputs into the development of new sources of renewable energy. In that way, irreversible current losses in resource depletion will be compensated by future gains in alternative energy production.

If the two criteria are combined, the sustainability threshold might be determined by the rate at which new renewable energy sources are coming on line in direct proportion to any decline in the output / input ratio of nonrenewable energy production mentioned above. That is, new renewable energy should become available at the same rate as nonrenewable sources become scarcer, We shall experiment with this model as a possible flow account.

The flaw in considering stocks only is illustrated by the original GPI method of using replacement costs alone to tally nonrenewable resource depletion, producing (not surprisingly) the highest single cost of any measure in the index. An investment perspective might produce a more realistic outcome by giving a current value to future potential gain.

These issues, and the draft accounts and discussion papers will be the subject of extensive consultation with officials in the Department of Natural Resources, with the Environment staff at Statistics Canada, Ottawa, and with several members of the advisory council. In the final reports, as before, policy relevance will be highlighted, and concrete recommendations for improved sustainability will be made in accordance with the trends manifested in the accounts.

d) Loss of Wetlands (Future)

The original GPI includes monetary estimations of the value per acre of the flow of services from an acre of wetland, and the consequent costs of the loss of wetlands in the United States. Once again, the index errs by considering absolute stock declines only, allowing no meaningful estimation of sustainability, and producing a cumulative one-way decline in the index.

However, flow accounts appear to be possible using the work of Dennis King at the University of Maryland who has compiled a detailed inventory of wetland functions and the economic values they provide (see Jansson, Investing in Natural Capital, 1994), and also assessed the value of reversing ecological damage by comparing the results of high, medium and low cost restorations (1991, see index). Although such "defensive expenditures" are initially proxies for prior damage done, they are also positive investments in natural capital that will yield future services and benefits.

In addition to the sources already cited in Chapter II (3) C (vii) d, the following contain useful monetary estimates of wetland functions:
R. Constanza et.al., "Valuation and Management of Wetland Ecosystems" in Ecological Economics, (1989), Vol.1, pp.335-361; L.E. Danielson and J.A. Leitch, "Private vs. Public Economics of Prairie Wetland Allocation", in Journal of Environmental Economics and Management, Vol. 13(1), pp. 81-92; and J.T. Winpenny, Values for the Environment: A Guide to Economic Appraisal (1991), London, Overseas Development Institute.

Due to the great complexity of this particular resource account, it is unlikely that it will be included in the phase two research. A sustainable development index can, needless to

say, be expanded continuously to include more information on more subjects. It is therefore recommended that wetland values be included at a later stage.

e) Biodiversity Valuation (Future)

Although a number of contingent valuation and replacement cost studies have attempted to assign monetary values to endangered species, these do not at present provide a solid foundation for a set of accounts, as discussed in Chapter II (3) C (vii) d. A recommended direction for future development of the Nova Scotia index is the physical and qualitative assessment of biodiversity in British Columbia in the Progress B.C. report. Task Nine will include a set of recommended indicators of biodiversity in Nova Scotia for future inclusion in the index. This will be developed in conjunction with Dr. Bill Freedman of Dalhousie's Biology Department.

f) Resource Intensivity of Industry (Future)

Environment Canada has ranked industries according to their resource, energy and contaminant intensivity, and the new Statistics Canada Material and Energy Flow Accounts (MEFA) give detailed statistics on resource, energy and waste flows by industry. It would be a great contribution to an index of sustainable development to rank provincial changes in the mix of industry according to these criteria. The percentage share of different industrial sectors of the Nova Scotia economy over time would indicate movement towards or away from sustainability. It would also be interesting to compare how resource, energy and contaminant intensive our economy is compared to other provinces.

Although it is unlikely that there will be time to complete this task in Phase Two of the project, it is a recommended direction for future development of the index, because of its direct policy relevance. Statistics Canada's planned regionalization of the MEFA will make this analysis much more feasible in the future. A profile of resource, energy and contaminant intensivity can aid policy makers in determining alternative investment strategies. It may be advisable to encourage and assist clean industries that use the least energy and resources rather than those may provide an immediate influx of cash, but produce long-term costs that will be paid for later.

Task Ten: Water Quality

After revisions and modifications, the basic model for assessing the economic costs of environmental impacts from human activity stressors that was tested in task ten (air pollution) will be applied to water quality. Monetary value estimates for aquatic resources as well as contingent valuation methods of "willingness to pay" for drinking water, from the Asian Development Bank workbook (Economic Evaluation of Environmental Impacts), will be tested here.

Three separate sets of accounts will be constructed, for:
a) surface water
b) ground water
c) the marine environment.

Surface water damage can result from both pollution, such as toxins, nutrient loads and fecal coliform, and from siltation due to erosion. Costs are measured as the result of both point source and nonpoint source impacts on recreation, aesthetics, ecology, property values and household and industrial water supplies.

Shellfish closures will be taken as one measure of marine environment quality, both as a general outcome-oriented indicator of water quality, and because of the direct measurable monetary impact and relevance to the Atlantic economy of this variable. For ground water, the primary concern in Nova Scotia has been a regional one, concerning the effects of agricultural practices on drinking water in the Annapolis Valley. For that reason, it is proposed that a separate set of data on this issue be compiled for Kings County.

Two procedural issues are:
a) In aggregating the total benefits and costs for the composite index in task 14, it will be important not to double count, for example, water quality costs here and the costs of acid rain from task seven.
b) Costs of household pollution abatement are not listed as a separate indicator, as in the original GPI. Instead, defensive expenditures on water filters, for example, are included in the water quality accounts, and air filter costs are included in the atmospheric emission costs calculated in task seven.

Task Eleven: Health Care

As discussed earlier, current health costs must be carefully disaggregated to distinguish preventive expenditures (investments in human capital) from costs incurred by damage already done. Outcome measures assessing the actual health of the Nova Scotian population will be used, coordinating these as much as possible with the measures used for health in the 1997-98 *Government by Design.*

Aside from consultations with Health Department officials, this set of accounts will rely on advice from Dr. Colin Howell of the Atlantic Canada Studies program at Saint Mary's University, who has studied the issues closely.

Task Twelve: Livelihood Security Index

Livelihood security, as one of the principal values of a sustainable development index (see Chapter II(3)(B)(i)(c)), is determined by a combination of many different measures. The original GPI includes four such measures: personal consumption, cost of underemployment, net capital investment, and net foreign lending or borrowing. In addition, shifts between part-time and full-time work, value of non-wage benefits, duration of jobs, length of periods of unemployment, and many other factors could be considered.

The phase two timetable will not permit a full consideration of all these factors at this stage. But we intend to produce at least a preliminary account including some of these variables, and pointing to the potential for expansion of this index in the future. We propose to focus on two issues, and to treat others more cursorily:

a) From the Statistics Canada data, we shall examine trends in involuntary part-time work in Nova Scotia, assessing an hourly dollar value for every hour of "underemployment" in the labour force, using the original GPI methodology (page 23) for this measure. Thus, a trend towards less involuntary part-time work would be a movement towards greater sustainability.

b) Debt will be counted as a cost only in so far it finances current consumption. Debt incurred for the sake of investment is not subtracted as a cost, as it is designed to yield future benefit. Debt incurred for consumption will, however, have to be repaid in the future, perhaps by the next generation. The original GPI considers only foreign lending or borrowing. But we are examining ways to expand consideration of this important factor.

There are important regional issues that affect both geographical equity and long-term livelihood security that will probably not be included in the phase two work, but could be part of an expanded index in the future. For example, in assessing alternative investment strategies, it would be helpful to know which industries rely more on local and regional inputs and thus produce greater spin-off benefits for the province than others.

Several measurements can assess movement towards greater regional equity, including capital movements, investment patterns, availability of venture capital, research and development in science and technology, and migration patterns. For example, what percentage of savings generated in Nova Scotia is reinvested here? What proportion of Nova Scotia pension funds remains here? Are we experiencing a brain drain or are we attracting talented and skilled personnel here?

Much of the data required to include such measures in the index, particularly on capital movements, are currently not in the public domain. One of the major outputs of task twelve is, therefore, to identify the indicators, measures and data requirements needed to expand the assessment of livelihood security in the future. We have already had discussions with Statistics Canada about needed future studies and surveys.

Task Thirteen: Other Human and Social Values

In Chapter II(3)(B)(iv), we noted that, although the current project focuses almost exclusively on the "necessary conditions" for sustainability rather than on qualitative improvements in life per se, an index of "development" rather than "growth" should eventually measure progress towards greater human freedom, tolerance, knowledge and compassion -- the so-called "higher" values. "Quality of life" indicator projects do attempt to measure these values, but there are enormous definitional ambiguities, and it is almost impossible to trace their linkages to economic factors with any precision. Furthermore, the assignment of monetary values is out of the question.

Despite these difficulties, it is equally invalid to ignore these critical values in an index of "development" that claims to measure qualitative progress. In this task, therefore, we intend to give two rather crude samples of measuring strategies for these higher values, simply to the point the way for better and more detailed valuations in the future.

For all its imperfections, we shall apply the standardized international "Human Freedom Index" (HFI) to Nova Scotia to assess trends towards or away from greater freedom. As discussed in Chapter II, we shall also apply the indices of the "Social Caring Capacity of a Community" developed in British Columbia to Nova Scotia.

Secondly, we shall assess trends in functional literacy (from Statistics Canada) and in standardized test scores to assess basic literacy and knowledge skills in Nova Scotia. Most quality of life indicator studies assess "education" by the percentage of different age groups graduating from high school or university. But there is no necessary correlation between the number of degrees granted and improvements in the *quality* of education, which we are concerned to measure. This task will necessitate consultations with Education Department officials and with educators.

Task Fourteen: Aggregation, Recommendations, Report

This task consists of two parts:

a) Composite Index to Gauge Overall Performance.

The sectoral data for all the measured indicators will be weighted, carefully processed to avoid double-counting, and then aggregated into a composite genuine progress index, to indicate an overall trend towards or away from sustainability. As emphasized earlier, this is not the initial purpose of the index, and it has less policy relevance for particular departments. Therefore, this task will be undertaken for discussion purposes only at this stage and will be conducted in close cooperation with Statistics Canada statisticians. Because there is generally a desire to see a "bottom line" to determine overall performance, the method of aggregation can be demonstrated.

b). Recommendations and Final Report

* A "report card" of progress towards sustainability in each of the indicators will be presented, analyzing the data and summarizing the main trends in each area. This will take the form of a column by column commentary on each of the data sets, including a brief review of the methodology used for each measure.

* Draft chapters of the report will be reviewed with relevant department officials and advisors and revised in light of their comments before inclusion in the final report. Because key policy analysts and planners in each department will be kept fully informed of progress throughout the project and will participate in the development of the index through ongoing consultations, it is unlikely that major substantive changes will be necessary at this stage.

* The final report will undoubtedly be lengthy, will include many clear graphs and tables, and will be presented in publishable form. It will be accompanied by an executive summary of the main points.

* Within each area, the policy relevance of the measured trends will be identified as clearly as possible. Based on the data, recommendations will be made to improve cost effectiveness in decision making and to support progress towards greater sustainability. The index will be demonstrated as a useful first step in informed decision-making.

* Major data gaps will be identified and recommendations made for priority areas in future data collection to improve the quality, breadth and depth of information available.

* Methodological difficulties will be identified and recommendations made for future improvements in valuation methods and for possible modifications and revisions of subsequent versions of the index.

* The future sustainability of the index itself will be addressed, including design for comparability with other jurisdictions, ease of data entry, interpretation and use, and coordination with other government initiatives, including the outcome measures, Round Table projects and other socioeconomic and environmental indicator projects. Also recommendations will be made on how the index can be integrated into existing accounting systems, and where it can fit in the existing structures.

* Recommendations will be made on ways to maintain and expand the process of consultation within the network of officials, policy analysts, researchers and experts who will have contributed in many ways to the construction of the sustainable development index. Methods of maintaining the linkages with Statistics Canada, in particular, will be discussed.

* Concrete proposals will be made for the next stages in the development both of the index and of the province's sustainable development strategy.

* Methods of coordinating the Nova Scotia project with similar initiatives outside the province will be identified and a framework for inter-provincial, and federal-provincial cooperation will be recommended.

Task Fifteen: Workshops, Seminars, Training Facilities

As stated earlier, it is a primary goal that the Nova Scotia "pilot project", as designated by Statistics Canada, Ottawa, should become, by the middle of 1999, an actual "working model". If this can be accomplished, there is a potential for direct economic benefit to the province. If the government adopts the index as an actual aid to policy making and commits itself to a strategy for sustainable development, it is highly likely that our example will be studied and scrutinized by other jurisdictions both within Canada and abroad.

The path we are charting with this index of sustainable development is not relevant to Nova Scotia alone, but is part of a global recognition and trend in the United Nations, the OECD, the World Bank and in many countries. If we can demonstrate, in practice and action, the new measures of progress that economists world-wide have called for, there will be great interest in our example. There is potential, for example, for a training program here in Nova Scotia for out of province representatives seeking to understand and apply measures of sustainable development to their own jurisdictions. The province would be a natural venue for conferences on the subject.

In addition, workshops, seminars and presentations will be necessary to Nova Scotia government groups, industry representatives, and professional and educational organizations, to explain the methodology, conclusions, use and applications of the genuine progress index.

Ultimately, successful progress towards sustainable development depends on the participation of the citizenry as a whole, of business, labour and non-governmental organizations as well as government. It requires an informed populace. For this reason phase two of the project should end with an educational effort within the province, so that the basic principles of the index filter out into the society as a whole. The building of genuine consensus and cooperation is crucial to the success of any sustainable development strategy.

3. Core Research Staff and Consultants

The project team consists of two core researchers, two part-time researchers, a statistician, a graphic designer for preparation of the graphs, accounts, charts and task reports, at least one specialist consultant for each project task, and the network of Statistics Canada staff and advisory council members who have agreed to review the material and provide assistance.

*** Ronald Colman, Ph.D** : Project director, senior researcher, and report author.

Born in Sydney, Australia in 1947, Dr. Colman received his B.A. with honours from the Australian National University, Canberra, and his doctoral degree with distinction in Political Science from Columbia University, New York, in 1976. He was a senior researcher for several years at the United Nations and has taught for nearly 20 years at the State University of New York, University of Colorado, Saint Mary's University and

Mount Saint Vincent University, specializing in international political economy, international trade and comparative politics. He has been living in Nova Scotia for eight years and is a Canadian citizen. Dr. Colman will have overall responsibility for the completion of the project as described.

Colin Dodds, B.A., Researcher.

Mr. Dodds is a mature student who graduated from Saint Mary's University in 1997 and is now pursuing his M.A. there in Atlantic Canada Studies. He was recipient of the Dalton Scholarship in 1996 and represented the university at the Harvard National Model United Nations in Boston. He is specializing in three areas of the GPI -- costs of crime, the transportation cost analysis, and health care investment and expenditures.

Calista Rajasingham, B.A., Researcher.

Ms Rajasingham graduated from Saint Mary's University in 1997 and is now pursuing her M.A. there in International Development Studies. She also represented the university at the Harvard National Model United Nations. She is specializing in the following areas of the GPI -- valuation of unpaid work and leisure time, including women's status in the work force, and natural resource accounting. She will also do the application of the Human Freedom Index to Nova Scotia, as a satellite to the sustainable development index.

Both Mr. Dodds and Ms. Rajasingham began working with Dr. Colman on alternative indices of progress as part of an academic project at Saint Mary's University in 1996, and they have been working together formally as a research team for the last six months, meeting for several hours a week since then. All three are officers of GPI Atlantic, the non-profit research institute established for the specific purpose of producing a sustainable development index for Nova Scotia.

Bruce Smith, Ph.D, Statistician.

Dr. Bruce Smith of the Statistics Department at Dalhousie University has been invited to join the research team during phase two to contribute ongoing statistical analysis of the data during each task. He is currently studying this proposal and will inform the project of his time and commitment availability early in the new year.

Theresa Ferguson, B.A., Economist and Researcher.

Ms Theresa Ferguson graduated with an Economics degree from Saint Mary's University, specializing in Atlantic Canada economics, and is now pursuing her M.B.A. there in Fiscal and Financial Studies. She has been a researcher for the Atlantic Provinces Economic Council and will do part-time research for the project, specializing in the costs and services of consumer durables, in the nonrenewable energy resource accounts and in the livelihood security issues, including net foreign lending and borrowing, capital investment and costs of underemployment.

Mr. Dennis Pearson, Report Design.

Mr. Pearson, of Communication Arts, design, advertising and marketing consultancy, has 20 years experience in print graphics and marketing communications with expertise in concept development through all phases of production. Mr. Pearson will design the visual graphs, charts and report forms at each stage of the project to ensure clarity of presentation and ease of understanding and interpretation.

Mr. Hans Messinger, Economist and Statistician.

Mr. Messinger is assistant director for interprovincial trade and socioeconomic indicators in the Input-Output Division at Statistics Canada, Ottawa. Mr. Messinger has been

contributing in-kind services in consultancy and advice, data provision and source references, organization of staff support services, and reconstruction of provincial data. He has made two three-day visits to Halifax to date to assist with the project, and will continue to work closely with the project team at all stages during phase two. He will address the inter-departmental consultation in February, 1998, lead the afternoon workshop, and host the inter-provincial conference in Ottawa later in the year.

Mr. Seth Nanayakura, B.A.(Economics), Researcher.

Mr. Seth Nanayakura, an Economics graduate from Dalhousie University, will be working with the project on a part-time basis from Statistics Canada's regional office in Halifax. He has previously worked with Statistics Canada in Ottawa, and is currently at the Ottawa office accessing unpublished data on provincial crime costs, unpaid work, valuation of leisure time and income distribution. Mr. Nanayakura's services are also being provided on an in-kind basis by Statistics Canada, through arrangements with Mr. Andrew Maw, regional office assistant director.

Consultants

In addition to in-kind advice, assistance and data sources provided by members of the project advisory council, as described in chapter II(2), there will be a need in phase two to engage expert consultants in forestry, fisheries, soil science, ecological economics, health economics and several other areas on an ongoing basis during several of the major tasks, in order to accomplish the project within the time frame proposed. It is estimated that these consultancies will generally range from five to twenty-five days, depending on the subject matter under investigation.

Careful consideration was given to the alternative of employing one other full-time researcher for phase two of the project. But it was considered more cost effective, especially given the network of potential consultants that already exists and the need for specialized expertise in the different areas, to engage specialists for limited time periods according to the task being performed. This arrangement also has the added advantage of allowing flexibility and task overlap, and can thus shorten the time needed for completion of a given task.

One example that has already been discussed and given consideration is to bring Mr. Mark Anielski from the Performance Measurements branch of the Alberta Treasury to Nova Scotia for a few weeks to work with the team on the forestry accounts. Given Mr. Anielski's vast experience in producing Alberta's forest stock, flow and value accounts (based on economic rents), carbon accounts, and the timber and forest sustainability indices for that province, his expertise would be invaluable in completing that particular task.

Since the intention of the Nova Scotia pilot project is to integrate and apply the best of the expert work that already exists into a full index of sustainable development, it makes sense to engage those specialists most knowledgeable about and conversant with the data sources and valuation methods that already exist in each area. In some cases this will involve additional transportation and accommodation expenses, but we are convinced that the quality of the results will justify the outlay, and will actually save time and money in the long run by dramatically shortening the learning curve for each subject area.

Selection criteria for short-term consultancies will include:

* extensive knowledge of the data sources, methodologies and underlying science of each subject area under consideration, including all relevant international case studies;

* practical case study experience in measuring and analyzing data directly related to the relevant indicator, including construction of time series, graphs and charts to present the material clearly and without bias so that it is comprehensible by non-experts;

* knowledge of sustainable development principles and practice, experience with the determination of sustainability thresholds and with economic-social-environmental linkages, and practical experience in policy applications of sustainability criteria;

* policy experience in advising governmental authorities in the consultant's area of expertise, including the completion of studies, reports and policy recommendations for government agencies;

* experience with economic valuations of non-market values, and with the design and application of financial and economic analyses of social or environmental data within the consultant's area of expertise;

* experience with the design and use of socioeconomic and environmental indicator studies, outcome measures and other performance measurement work;

* proven ability to work cooperatively in a team setting, to deliver on time and within budget, to present findings coherently and impartially, and to be available for necessary follow-up consultations.

In short, although academic expertise is a necessary prerequisite for specialized knowledge in the different indicator subject areas, it is clear from the selection criteria that primary emphasis will be placed on practical policy experience and concrete applications. Expert knowledge must be combined with the practical ability of the consultant to know what he or she is looking for, how to find it, how to apply valuation techniques, and how to analyze the data, construct time series and present it clearly, impartially and understandably for policy relevance.

IV POLICY RELEVANCE

While the Nova Scotia pilot project to develop an index of sustainable development has several concurrent goals, outlined in chapter III(1) above, the overriding concern is to provide significant concrete and practical policy benefits for Nova Scotia, and eventually for the country as a whole. In fact, the ability of the index to make the data and findings policy relevant is a touchstone of its success in accomplishing all the other goals. For this reason, the following summary of intended policy benefits is extracted from Attachment B, section 4, and included in this proposal.

1. Better Information through Benefit-Cost Analysis

Good information is the first step in any decision-making process. The more accurate and precise our indicators of progress are, the better able will policy makers be to make informed decisions. As an aggregate measure of growth which simply adds together the production of all goods and services, the GDP is a rather blunt instrument which does not distinguish economic activities which cause benefit from those which carry hidden costs. The fundamental purpose of the GPI is to incorporate benefit-cost analysis into the accounts, so that assets and liabilities can be clearly valued and measured in accordance with business and household balance sheet accounts.

For example, it will be helpful for policy makers to distinguish a shift from one productive sector to another from a change in total production. Thus, in recessionary times, a shift to the informal economy may artificially magnify a decline in the rate of GDP growth which counts only monetary market transactions. Conversely, a shift from the household sector to the paid economy, as in expanded child-care, may not denote any actual change in total productive activity, even though the GDP registers the shift as economic growth. Distinguishing, valuing and including both market and nonmarket production, sends more accurate signals on such shifts in relation to the total levels of production.

Similarly, by including valuations for leisure time, it will be possible for policy makers to distinguish productivity gains resulting from greater efficiency from those that flow from longer work hours. In these ways "quality of life" criteria can be incorporated naturally in economic decision-making processes on the basis of more accurate benefit-cost analysis of the trade-offs involved in particular policies. Economic activities that detract from or provide no net gain to welfare will not misleadingly appear as economic growth. In this way better information can also reduce the gap between policy pronouncements and public experience by ensuring that indices of progress accurately gains in social well-being and prosperity.

Most importantly, a depletion of natural capital will not be recorded as economic gain, a practice that sends confusing messages to the policy arena. A good accounting system should make clear when capital assets are being converted to current income. Just as good book-keeping practices aid businesses and households in assigning priorities and evaluating choices, a more comprehensive accounting system can provide the knowledge base for informed decision-making by provincial authorities.

2. Investment Strategies and Long-Term Planning

The expanded accounting systems do not just have *more* information, as described in (a) above. They also reflect a fundamentally different view of the economy as investment-guided rather than consumption-driven. Sustainable development requires a long-term

perspective for which the monthly or quarterly changes in the GDP provide little guidance. Our economic indicators currently provide inadequate information on the future potential of different types of investment.

Just as the insurance industry sets premiums based on past records and estimations of future costs, so the GPI calculates present values based on potential future benefits and costs. This will enable policy makers to discriminate more precisely between alternative investments and actively woo the types of industry and development most likely to contribute to long-term well-being.

For example, Environment Canada currently ranks industries according to their degree of resource, energy and contaminant intensivity. If, according to these criteria, a new investment will likely lead to later resource depletion, infrastructure demands and pollution clean-up costs, policy makers might eschew the short-term infusion of capital in favour of alternative investment strategies. As the new accounting systems are refined and improved, it should be possible also to determine which industries will use more local inputs and produce more spin-offs and better quality jobs for the provincial economy.

The fisheries model discussed above also demonstrates a very practical way to determine the maximum sustainable economic return from a natural capital asset, and thus to calculate the number of workers who can be gainfully employed from harvesting the resource and the optimum capital investment required. This will help prevent the over-capitalization and under-employment that have characterized some resource sectors like the fisheries in the past.

In short, an investment-oriented accounting system will make qualitative distinctions between alternative investment strategies more feasible.

Instead of the nineteenth century division of productive factors into land, labour and capital, which still dominates much conventional economic analysis, the newer investment-guided strategies see all productive factors as capital -- natural capital (resources and ecosystem functions), human capital (including the health and education of the labour force), man-made or produced capital (like plant, equipment and infrastructure), and social and cultural capital (including social institutions, community stability and political processes).

All forms of capital are subject to depreciation and require new investments if they are to provide a flow of services into the future. For example, rapid technological change, and the increasing importance of knowledge and information as productive factors, require more frequent re-training than ever before. Our accounting systems must reflect investments in appropriate education not just as current costs but as potential future benefits.

3. Early Warning Systems for Timely Remedial Action

An accounting system that measures the depletion of a natural resource like the fishery as the depreciation of a capital asset, sends timely signals to policy makers that allow a graduated incremental response including limitations on exploitation and reinvestment in the resource (allowing the capital stock to rebuild). Without such early warning systems built into our accounts, policy makers will react to crises when it is too late to take constructive remedial action.

Indeed, the current system sends precisely the wrong message, since excessive exploitation of a resource registers as industry health and economic growth. The subsequent structure of prices, taxes, subsidies and other financial rewards and penalties reinforce that message.

Ideally, this particular function of sustainable development accounts is analogous to the function of good diplomacy. Former U.N. Secretary-General U Thant once remarked that the most successful diplomacy is that which is never reported because the crisis never occurs. He had just defused a potentially dangerous situation in the Persian Gulf before it was ever reported in the media.

Steady sustainable and equitable development with little pollution or waste and regular incremental adjustments designed to restore equilibrium may not be as glamorous or newsworthy as the dramatic crises and swings in the business cycle to which we have become accustomed. But such a development path, responding and adjusting to early warning systems in the accounts, can gradually contribute to genuine security, prosperity and well-being, a reduction of conflict and a profound trust in government and social institutions.

This may sound visionary, but it is actually a very practical preventive diplomacy based on timely incremental investments in response to depreciating capital assets. The basic requirement is simply an accounting system that accurately measures the rate of depreciation.

4. Steps to Full-Cost Accounting for Sustainability

The Nova Scotia Round Table on Environment and Economy recognized full cost accounting as a key principle of its "Sustainable Development Strategy for Nova Scotia". It noted that resources must be valued "so that the cost to the user is a reasonable reflection of the benefits and costs to society" (page 11).

It is clear that once natural, human and social capital are explicitly valued in the provincial accounts, a whole range of financial instruments becomes available to policy makers. Tax structures, subsidies, loans, financial incentives and price structures will gradually reflect the values assigned in the provincial accounts and can be used creatively by policy makers to promote sustainable development.

In other words, moving from consumption driven growth to sustainable development requires a change in behaviour and lifestyle by individuals and businesses. While long-term education is critical in this process, financial incentives are by far the most direct agent of change. Just as the dramatic rise in oil prices in the 1970s and early 1980s produced extraordinary innovation in energy conservation and efficiency, so full-cost accounting methods can provide the financial instruments for needed social changes.

For example, once our accounts accurately reflect the value of our forest resources, sustainable harvesting practices can be induced on our woodlots through a combination of financial instruments. The recent (October 1997) National Round Table report on "Private Woodlot Management in the Maritimes" cited misleading pricing mechanisms in the financial and market systems as a primary reason for unsustainable forest management practices:

> *Current market demands lead to highgrading, market specialization and premature harvesting . The absence of financial incentives for owners to make the "right" decision is accompanied by the desire to make "fast money". Essentially, because of poor understanding of the*

> *facts, people do not have the information that could motivate a change in their behaviour (page 16).*
>
> *...There appears to be no clear economic return on an investment toward sustainability for the woodlot owner....Often decisions are made without a proper understanding of the complete economic picture.... Accurate information...is needed, as is a better understanding of market drivers and their impact on sustainability....There is consensus (among stakeholders) that the tax implications of woodlot management should be reexamined (pp.12, 18, 19).*

The Round Table report, and the actual crisis in the industry which the report spotlights, is a graphic example of the confusion that pervades both the policy arena and business and individual decision-making when market prices do not accurately reflect full costs, and when financial rewards and penalties in the taxation system and other financial instruments actually encourage unsustainable behaviour.

Natural resource accounting is the necessary first step to incorporating full benefits and costs in all aspects of our financial system. That, in turn, will give policy makers a range of practical options to encourage sustainable practices and to send clear and accurate signals that will enable businesses and individuals "to make the 'right' decision," as the Round Table report recommends.

5. Clarity of Purpose, Vision and Direction through Benchmarking and Comparability

Because an accounting system that measures sustainable development has an ethical basis linked to a sense of vision -- concern for the well-being of future generations, -- policy makers will be more able to inspire and mobilize the populace. Policy will be less reactive and more focussed and directed when inspired by this sense of responsibility than our current system based on consumption-driven quantitative material growth. We already have a precedent for sustainability in debt-reduction strategies on the understanding that it is unethical to allow current consumptive excesses to leave future generations with a major debt burden.

Furthermore, the incorporation of "quality of life" indicators into our economic accounts and the explicit linking of social, environmental and economic factors in the accounting procedures, naturally bring consensus values into the arena of policy making. What we count and measure is what we value, and the inclusion of social and environmental values in our accounts can actually begin to move us from the spiritual and ethical vacuum of a materialist society to a more harmonious, cooperative sense of community. In short, policy becomes grounded in a practical long-term vision designed to benefit our children.

Without such a sense of vision and direction, we have no standards against which to measure genuine progress, or even to compare our progress as a province with that of others. The incorporation of explicit goals and values into our accounts provides a set of quality standards which can inspire improvements in performance by individuals, governments and industry. If the standards reflect a fundamental social consensus confirmed by international conventions such as the Rio Declaration and the Universal Declaration of Human Rights, then they provide the basis for international comparability.

In this sense the sustainable development index shares the basic approach of the outcome measures initiative of the Nova Scotia government which also begins with a mission

statement, a "quality of life" declaration and an explicit set of goals against which the measurement of progress is possible (*Government by Design,* pp.7-21).

The practical expression of this sense of purpose, vision and direction as a guide too policy-making, is the practice of "benchmarking" popularized in recent years by the Oregon Benchmarks project, the Sustainable Seattle initiative and others. Thus, long-term optimum targets are explicitly set, along with realistic interim goals for specific years that mark progress towards the type of society to which the populace and policy-makers aspire. These provide a **coherent policy framework** that encourages integration of policy initiatives.

In addition to standards and targets, a sustainable development index also includes sustainability "thresholds" which mark the scale of particular economic activities that will preserve a harmonious balance between human society and the encompassing ecosystem. Like goals and benchmarks, these thresholds provide standards against which to measure levels of consumption, resource harvesting, pollution emissions, and waste generation.

6. Taking the Lead

With a small population, a strong sense of community and a relatively good environment and quality of life, Nova Scotia is uniquely placed to take the lead in developing and adopting these new accounting procedures and charting a course towards truly sustainable development.

More than most, we have also experienced painfully and directly, through the collapse of the fishery, the flaws of failing to account for natural resource depletion. And due to our chronic economic backwardness in relation to central Canada, we are perhaps more likely to question conventional economic assumptions and to search creatively for alternative directions.

Taking the lead will itself produce tremendous economic spin-offs, attracting environmental industries and turning Nova Scotia into a laboratory for sustainable development. Others will come to study and learn from our experience.

In 1990 the Regional Municipality of Hamilton-Wentworth in Ontario embarked on a deliberate strategy to become a fully sustainable region by the year 2020. In its own words, "sustainable development and the goals of the community vision have become the basis for change in decision-making" in the Region.

The local government's initiatives attracted sustainable industries and received international recognition. Within a few years, the Region was designated the Canadian model community under the Local Agenda 21 Model Community Program, and became one of only 14 communities around the world to serve as official role models for creating a sustainable community.

Environment Canada selected Hamilton-Wentworth for the 1994 Canadian Environmental Achievement Award for local government, and in 1995 the United Nations Commission on Sustainable Development chose the Region as one of only 19 communities around the world to be recognized as a model sustainable community. These awards have, in turn, generated many visits from delegations throughout the world, providing economic benefits to the region.

The Hamilton-Wentworth example demonstrates clearly that a fundamental shift in the policy-making framework towards sustainability and clearly articulated community goals

is not only possible, but can yield great benefit both economically and in generating community consensus. Nova Scotia has the capacity, the means and the conditions to take the lead as a province and to generate tremendous interest in the model created here. The development of the *Government by Design* outcome measures initiative shows the province's capacity to create the type of coherent policy framework necessary for a successful sustainable development strategy.

Statistics Canada has already designated our current work as a "pilot project" which could form the basis for wider application at the federal level and by other provinces. The movement towards more comprehensive accounts linking social, environmental and economic variables is a global one in which considerable progress has already been made.

It is widely recognized by leading economists world-wide, including World Bank leaders and Nobel laureates, that the new economy of the 21st century can no longer rely on a simplistic and outdated accounting system inherited from the second world war. There is an urgent need for an accounting system that accurately reflects the reality of the new millennium, with its anticipated resource shortages, environmental challenges and population growth. What is needed now is one jurisdiction to integrate the work already developed and to apply the new accounting methods in a coherent and systematic way.

In short, there is a tremendous opportunity here for Nova Scotia to take the lead in promoting the development of these new ways of measuring our prosperity and well-being, and to become the first province in Canada to move systematically towards a sustainable future. The time and circumstances are right for a practical application of a well developed model, and the potential exists for the province to become a magnet for policy planners and students eager to learn from the experiment.

7. Design for Practical Policy Use

The Nova Scotia GPI is concerned primarily with comprehensive sectoral accounts giving a portrait of each indicator, rather than with building a composite index of overall progress. In this way it differs markedly from the original GPI of Cobb, Halstead and Rowe which omitted almost all government expenditures as essentially defensive in nature and was interested mainly in demonstrating an overall bottom line trend that differed markedly from the GDP. Since policy making is primarily sectoral in nature and deals with specific issues, such sectoral book-keeping will have more direct policy relevance.

That comprehensive sectoral focus is possible because the indicators are held together through the integrating theme of sustainable development and through the goals and values outlined in Chapter II(3)(1) and (2). The separate indicators then express the actual practical policy applications of the overall sustainable development strategy and agreed values. Rather than acting primarily as a critique of the GDP, which was the basic intention of the original GPI, the Nova Scotia sustainable development index becomes a positive expression of a coherent policy initiative and the separate indicator accounts reflect progress towards that goal.

One example will demonstrate the greater relevance of sectoral accounts for policy making. Cobb's GPI included private defensive expenditures like burglar alarms and security devices in the costs of crime, but omitted prison, police and court costs because the GPI baseline had already excluded government expenditures. The Nova Scotia GPI, by contrast, will include government expenditures, victim costs, property losses and

defensive expenditures, and then create ratios of costs to particular crime categories (violent, property, juvenile, etc).

After making adjustments for changes in sentencing lengths over time, it will be possible for policy makers to use the index to correlate changes in crime rates with cost savings and increases. The figures will be further disaggregated to show which areas of investment in crime prevention will likely produce the greatest cost savings, thus freeing up capital for more productive purposes.

In a similar vein we are currently working on valuations of household and volunteer work, leisure time, and income distribution, again with a view to policy relevance. From these indicators we are also compiling an analysis of the work status of women which already suggests some interesting policy directions.

We are also presently studying alternative methods of natural resource accounting and will be collecting data in that area in the coming months, again leading towards comprehensive accounts of the multi-service values of each resource. This basic approach should assist policy makers in making informed choices between alternative uses of each particular resource.

It should also be emphasized that indicators are being chosen and constructed in such a way as to provide ready and easy comparability with the other provinces, the Canadian average, and other countries. In this way it will be possible to assess progress towards sustainable development not only internally by comparison with historical trends, but also in relation to other jurisdictions. Thus, the benefits of a sustainable development approach in itself should become gradually more apparent by comparing progress with jurisdictions that have opted to adhere to more conventional growth models.

Finally, it should be noted that in compiling the final composite genuine progress index, some of the factors included in the sectoral accounts will have to be omitted in order to avoid double counting. But that aggregation remains a secondary objective. The primary design goal of the index remains convenience of use by policy makers, relevance to issues of importance, and ease of data entry, interpretation and analysis of trends over time to allow continuity of use.

V. MEETING THE OBJECTIVES OF THE ECONOMIC DIVERSIFICATION AGREEMENT

Establishing a process of measuring sustainable development can play a key role in meeting the objectives of the Economic Diversification Agreement (EDA). A comprehensive investment-oriented accounting system that links economic, social and environmental factors, sends more accurate signals to policy makers, includes benefit cost analysis, and measures progress towards sustainability, is key to the "strategic planning" objective that underlies the Economic Diversification Agreement as a whole. As such, the new index can assist directly in moving simultaneously towards several of the stated goals of the EDA:

1. Building on Strengths

As an index of sustainable development, the GPI is designed specifically to include measures of social, community, cultural and "quality of life" variables, drawing links to the economic benefits derived from social and cultural strengths and a good environment. In fact, this Nova Scotia project parallels the impending inclusion, for the first time, of cultural and heritage capital in Statistics Canada's wealth accounts.

The province's good quality of life, natural beauty and community stability are often described anecdotally, and there are many examples of Nova Scotians returning home for these reasons after leaving the province to pursue employment prospects elsewhere. But we have lacked the overt statistical evidence to prove what we know both to ourselves and others. The genuine progress index provides a direct way of beginning to measure the province's strengths in culture, heritage and quality of life and to draw attention to their economic benefits.

2. Concentration on Quality and Global Vision

In contrast to the GDP's exclusive concern with *quantitative* growth, the genuine progress index measures *qualitative* improvements in life, society and environment. The GPI's underlying view and integrating theme of sustainability are directly linked to Canada's global commitments and vision and to the EDA strategy which specifically emphasizes "a concentration on quality and a global vision."

3. Commercialization of R. and D.

Having already been recognized by Statistics Canada as a "pilot project", and with a multidisciplinary approach that combines scientific, social and economic data, the Nova Scotia model GPI carries great potential for attracting students and researchers to the province and is an excellent example of the commercialization of R & D for which the EDA strives.

As described in Chapter IV(6) above, the example of the Regional Municipality of Hamilton-Wentworth demonstrates the potential power of a sustainable development strategy to create economic opportunities through international recognition of its role as a working model community.

Chapter 3(1), Goal 7, has already drawn attention to the function of the genuine progress index as an educational and heuristic tool. There is no doubt that the development of a

working index of sustainable development, building on Statistics Canada's recognition of the project to date, can contribute directly to Nova Scotia's role as an international centre for education and research

4. International Centre for the Environment

The important role of environmental data in the new economic accounts reinforces Nova Scotia's emerging role as an "international centre for oceans and the environment", as discussed in the EDA. In fact, by developing a sustainable development index, Nova Scotia will become the first province to fulfill Canada's explicit commitments under Agenda 21 at the 1992 U.N. Conference on Environment and Development to expand the statistical accounts to include natural resource and environmental accounting.

By creating benchmarks of sustainable resource use and standards for environmental quality, the index will also support the provincial strategy of environmental protection and attract environmental industries specializing in pollution abatement, energy conservation and efficient resource use.

5. Strategic Alliances in Building Economic Infrastructure.

The consensus building process, the emerging public-private partnerships, and the collaboration between the academic, government and private sectors in the construction of the genuine progress index, all support the EDA's advocacy of strategic and cooperative alliances in building economic infrastructure. Indeed, a sound accounting system that values natural and human capital is the very foundation of a strong economic infrastructure.

The interdepartmental consultation on the new accounting methods planned for March 1998 and the academic-governmental-private partnerships already forged are steps towards the EDA objectives that "the efforts of all levels of government, the private sector and the not-for-profit sector must be combined...." and "that initiatives not be implemented in isolation."

In fact, the proposed accounts linking economic, social and environmental factors are multidisciplinary by nature and are a natural integrating mechanism for economic initiatives through the common theme of sustainable development. The index thus helps provide a coherent policy framework which can directly encourage "integration and coordination of initiatives", as called for in the EDA.

6. Adapting Creatively to Changing Circumstances

Because the GPI measures the depletion of resources as a depreciation of natural capital, the index can send early warning signals to policy makers, thus allowing for timely, graduated and incremental remedial action rather than crisis responses. As such, it is specifically designed to assist industry leaders and policy makers in adapting creatively to changing circumstances, another stated purpose of the EDA.

In a deeper sense, a sustainable development index is also a direct response to the demands and requirements of the "new economy", with its understanding of the critical roles of natural and human capital.

Perhaps no changes have been as profound in recent decades as the increasing importance of knowledge in economic development and the understanding of the necessity for working within the constraints of the ecosystem life support functions on which the human economy depends. By giving direct value to natural and human capital, the genuine progress index expands the definition of capital in the conventional accounts, and adapts creatively to the changed circumstances of our new systems of production.

7. Focus on Best Prospects (Strategic Industries)

Because it includes long-term benefit cost analysis in its valuations, an index of sustainable development can assist policy makers in strategic investment decisions, distinguishing clearly between investments that provide an initial infusion of capital but carry long-term hidden costs and those that produce long-term stability, benefit and sustainability. In this way, as described in chapter IV(1) and (2), the index supports the EDA's concern to "focus on best prospects (strategic industries)".

8. Supply Constraints: Use of Best Practices, Benchmarking Techniques

Targets, standards and thresholds are the basis of the sustainability criteria and measurement methodology of the genuine progress index. Optimum goals are based on measurements of "maximum sustainable yield" and "maximum economic return"

(investment efficiency) from resource use. In this way the index is in accord with the EDA's recognition of the "supply constraints and increasing competition" facing Nova Scotia's resource industries and supports the principle of "use of best practices, (and) benchmarking techniques".

9. Better Information and Intelligence

The comprehensiveness, benefit cost analysis and more precise measuring tools of the GPI help provide the better market information and intelligence called for by the EDA, thus providing opportunities for sound investment strategies.

10. Underlying Purpose and Principles of the EDA.

In short, although the current project is funded under one particular section of the EDA (Section V: "Building Economic Foundations and Improving Business Climate"), the creation of a sustainable development index for Nova Scotia will provide a set of accounts that simultaneously support and give strength to the underlying objectives of the Agreement as a whole.

In our literature review of other indicator initiatives in North America, we found many excellent and well-intentioned efforts that, sadly, remained academic exercises or were conducted by research institutes and community groups with little reference to policy processes. Not surprisingly, these studies had little effect on policy outcomes and frequently lost their sense of direction and purpose.

It is therefore our intention to learn from these experiences, to anchor the GPI project firmly in Nova Scotia government processes, to pay particular attention to forging partnerships and cooperative working relationships with inputs from all strategic sectors and stakeholders, and to make the index relevant and useful for policy purposes.

These objectives carry equal weight in our project definition with the research itself, and are, we believe, in accord with the underlying spirit, purpose and principles of the Economic Diversification Agreement. Although our implementation schedule above is described in terms of research tasks, it should be understood that the goals discussed in this section will pervade the endeavour as a whole.

There is an extraordinary opportunity here, we firmly believe, for Nova Scotia to take the lead in creating a sound infrastructure for sustainable development that can become a model not only for the rest of the country but far beyond our own borders. The utilization of some of the most advanced measurement and accounting practices available in the world is an important first step in this direction. From that base it will be possible to move decisively towards the new economy of the 21st century, and to foster the human resource development and strategic investments that will best guarantee a sustainable future for the next generation of Nova Scotians.