# Valuing Bhutan's True Wealth

## Using the new National Accounts to inform enlightened GNH policies

Karen Hayward, Linda Pannozzo, and Ronald Colman
*GPI Atlantic*

With contributions from
Robert Costanza and Ida Kubiszewski,
*Institute for Sustainable Solutions, Portland State University,* and
David Batker, *Earth Economics*

February 2012

BHUTAN WILL BE THE FIRST COUNTRY IN THE WORLD TO CREATE **GNH ACCOUNTS** THAT PROPERLY VALUE OUR PRECIOUS NATURAL, SOCIAL, CULTURAL, AND HUMAN RESOURCES, AND THE COSTS OF THEIR DEPRECIATION, ALONG WITH THE MANUFACTURED AND FINANCIAL RESOURCES THAT ARE PRESENTLY COUNTED. SUCH FULL-COST ACCOUNTS ARE THE NECESSARY FOUNDATION OF A GENUINE WELLBEING AND SUSTAINABILITY-BASED ECONOMIC SYSTEM AND WILL ASSESS THE TRUE BENEFITS AND COSTS OF ECONOMIC ACTIVITY.

- LYONCHHEN JIGMI Y. THINLEY
PRIME MINISTER, ROYAL GOVERNMENT OF BHUTAN

# Note to Readers

This document is written as a "prospective" description of what a new set of National Accounts for Bhutan *might* look like, based on the prior work of these particular authors and contributors. Such accounts, it is proposed, would include proper measures of natural, social, cultural, and human capital in addition to the produced capital conventionally measured, in order to assess Bhutan's true wealth as a nation and to account more accurately for the full benefits and costs of economic activity. Such accounts would be the foundation of a new wellbeing and sustainability-based economic paradigm that advances the values, principles, and practices of Bhutan's holistic Gross National Happiness development philosophy.

However, it must be recognised that such a sharp departure from GDP-based accounting, conventional balance sheets, and the dominant current global "economic growth" paradigm is a very major undertaking that will require extensive consultations with Royal Government of Bhutan policy makers and officials and with top global experts on the structure of the new accounts, their constituent components, the methodologies used to assess non-market values, and much more.

Therefore, all references in the following pages as to what Bhutan's new National Accounts "will" look like must be strongly tempered with the understanding that this is a prospective 'vision' document reflecting only the views and experience of the authors and contributors, and that everything proposed is subject in practice to detailed review, consultation, and revision. At the same time, such a detailed and seemingly definitive outline was deemed necessary in order to give policy makers in Bhutan an idea of what such accounts might actually look like, how they could actually operate in practice, and what benefits they can provide in improving the evidence base of policy.

Bhutan's movement from a conventional GDP-based accounting system and economic paradigm to a holistic model, accounting for environmental, social, and cultural values in accord with GNH principles, began in December 2010 and March 2011 with two workshops and training sessions hosted by the National Statistics Bureau and conducted by contributors to this report.

At that time it was decided to develop not only this "prospectus" overview of the new National Accounts, but also three sample demonstration accounts in the fields of natural capital, social capital, and human capital, so that the new system would not appear purely conceptual and theoretical but show in hard numbers and application of actual methodologies how the new accounts could work in practice.

To that end the authors and contributors have, in the past 9 months, also developed the first ever economic valuations of Bhutan's ecosystem services (natural capital) and voluntary work (social capital), and the National Statistics Bureau has for the first time assessed the direct economic costs of alcoholism in Bhutan (human capital). Select results will be released in February 2012 alongside this report.

## Preface

*In this day and age, economic valuation is an essential strategy and tool to draw policy attention to vital natural and social assets that remain hidden in the conventional accounts, and thus to re-direct policy attention to their protection and restoration.*

Bhutan is poised to become the first nation in the world to adopt a full-cost accounting system as the basis for its new National Accounts. This will enable Bhutan to formulate policies, allocate resources, and present budgets that properly account for the value of natural, human, social and cultural wealth, in addition to that of the manufactured and financial capital captured in conventional accounting mechanisms.

Conventional balance sheets and GDP (Gross Domestic Product)-based accounts give no value to nature or other assets that are essential preconditions for human happiness and for the wellbeing of life forms, and they therefore fail to account for a nation's true wealth. In fact, when forests are cut down and other natural resources are depleted and degraded, GDP goes up and the economy "grows" even as we destroy the natural capital on which our children will depend for their lives and livelihood. That's because GDP and our standard economic growth statistics only count the resources we *extract* and sell in the market and fail to count what we leave behind.

In conventional accounts, even pollution and natural disasters are "good" for the economy, because all the costs of repairing disaster damage and cleaning up pollution make GDP grow. So, for example, forest fires, landslides, earthquakes, "dirty" industry, coal mining, and increased car sales make GDP grow, but the costs of air pollution, carbon emissions, and congestion remain invisible in our present national accounts. Similarly, sickness, war, crime, and cigarette sales make the economy grow (and are therefore misleadingly counted as economic gain) simply because money is being spent on drugs, weapons, prisons, and respiratory illness treatments, even though the social ills that cause such expenditures signify a decline in wellbeing.

Such deceptive accounting necessarily leads to policy distortions and misguided investments. For example, it is doubtful that Fukishima nuclear power plant would ever have been built in a full-cost accounting system. Instead, the supposed economic benefits of nuclear power were counted as part of Japan's GDP, but the costs of nuclear power were ignored. In fact, all the money spent trying to stop a nuclear melt-down, fighting the Fukishima fires, and repairing Japan's disaster damage made GDP grow again! It is no wonder that policy makers worldwide daily make decisions that are disastrous for nature: — they are getting the wrong signals from their accounts and progress measures. That is not a GNH approach**.**

Bhutan's pioneering **GNH-based National Accounts** that properly value our precious natural, social, cultural, economic, and human resources will provide the foundation of a new wellbeing and sustainability-based economic system. In an era when the degradation and destruction of nature threaten human life on earth, the United Nations, the World Bank, the OECD, the Stiglitz

Commission[1] appointed by France's President Sarkozy, and many others have all recommended valuations of natural and social capital, but no country has yet revised its National Accounts to put that recommendation fully into practice. All of them still rely on narrow and out-dated GDP measures to assess prosperity and progress.

So Bhutan's ground-breaking new National Accounts, to be developed in the next five years, matter not only to this country but will be closely watched globally. And the information that the new National Accounts provide will provide far more accurate information to policy makers that help them make wise decisions that properly account for and protect Bhutan's rich natural, cultural, social, and human wealth.

The purpose of the new National Accounts, therefore, is to provide a more comprehensive set of measures that can accurately identify our strengths so that we can build on them and protect them rather than take them for granted, and that can identify our weaknesses so that we can work to overcome them as soon as we detect early warning signals. Thus, the new National Accounts, using the best available data and measurement methodologies, are intended to provide policy makers with practical and realistic tools on which to base GNH policies and to measure progress towards genuinely sustainable prosperity and true wealth. This new accounting system will naturally support policies that shift behaviours towards sustainability and that build a GNH society that nurtures the happiness and wellbeing of individuals, families, communities, and the natural world. As such, the new accounts are in line with the Honourable Prime Minister's stated goal to bring GNH principles, values, and practices fully into the fabric of Bhutanese society.

But **how** do we properly and accurately account for the value of our forests, soils, water resources, biodiversity, clean air, and protected areas, and for the costs of forest fires, pollution, climate change, soil degradation, natural disasters, and traffic congestion — or the value of our education, population health, unpaid work, safety and security, and culture? At the 2009 U.N. Climate Change Conference in Copenhagen, Bhutan swore to remain a net carbon sink in perpetuity, but how, for example, do we assess the economic value of our forests in sequestering carbon from the atmosphere?

Fortunately, the data sources and methodologies to undertake these valuations and assessments now exist. Over the past 30 years, ecological economists and other international experts have increasingly refined and improved full-cost accounting methods, and developed valuations and methodologies that can now be translated into the Bhutan context. A number of these experts have also volunteered to work with Bhutan in the next few years to help develop and integrate these measures into the new National Accounts, and they have already developed preliminary estimates of the economic value of Bhutan's ecosystem services and voluntary work as key examples of natural and social capital.

This prospectus written especially for Bhutanese civil service professionals and policy makers, is a first step in attempting to explain a few of the purposes and key assumptions, principles, and structural foundations of the new National Accounts — the "why", "what", and "how" of the new accounts. As an introductory guide, it also attempts to demonstrate the potential utility and practical relevance of these full-cost measures to policy formation in the current economic conditions and into the future. It discusses the differences between indicators and accounts and why both are essential; it briefly reviews the problems with using the GDP as a measure of prosperity and wellbeing; and it cites examples to show how the new full-cost accounts might inform policies. Although this is definitely not intended as a comprehensive methodological instruction manual, it

does provide a few select examples of the types of methodology needed to construct full cost National Accounts.

In essence, this prospectus attempts to answer two basic, but very important, questions for Bhutanese policy makers and civil servants: Why are we now measuring natural, human, social, and cultural capital, and why is measuring these capitals important? Once agencies and policy makers understand those basic premises, then the next steps, such as choosing measurement priorities, assessing data needs, and using the new evidence to craft wise policy will follow naturally.

## Acknowledgments

The authors gratefully acknowledge funding for this prospectus from the Alerce Trust in Scotland. Invaluable and generous resource support is being provided by the Institute for Sustainable Solutions at Portland State University (U.S.), and by Earth Economics in Tacoma, Washington (U.S.) The Royal Government of Bhutan — in particular the National Statistics Bureau, the Centre for Bhutan Studies, the Ministry of Agriculture, and the Gross National Happiness Commission — have all provided very helpful assistance and support in many ways.

Parts of this prospectus, especially sections on methods for valuing natural capital and ecological services, were adapted from the record of the GNH Accounts Workshop "Valuing Nature: Accounting for the Value of Natural Capital and Ecosystem Services," led by Dr. Robert Costanza, Dr. Ida Kubiszewski, and David Batker on 29–30 March 2011 in Thimphu. That workshop was hosted by the National Statistics Bureau and the Royal Government of Bhutan in collaboration with GPI Atlantic.

Errors or misinterpretations and all viewpoints expressed are the sole responsibility of the authors.

# Table of Contents

## List of Tables

## Introduction

*Ultimately we have to create a new vision of what the economy is and what it is for, and a new model of development that acknowledges the new full-world context.*

- Robert Costanza[2]

In July 2011, the Kingdom of Bhutan introduced resolution A/65/L.86 to the United Nations on "Happiness: towards a holistic approach to development," which was unanimously adopted by the 193 members of the U.N. General Assembly. The resolution recognizes that happiness is a fundamental human goal, that GDP does not adequately reflect the wellbeing of people, and that unsustainable patterns of production and consumption impede sustainable development. The resolution also calls on nations to develop measures that do capture the pursuit of happiness and wellbeing in development. The essential precondition of such a holistic approach to development is a new wellbeing and sustainably-based economic paradigm, which in turn must rest on a foundation of full-cost national accounts that properly assess the ecological, social, cultural, economic, and human dimensions of wellbeing.

Just as the Kingdom of Bhutan has introduced the Gross National Happiness (GNH) approach to development internationally, it is also poised to become the first nation in the world to adopt a full-cost, ecological national accounting system. This means formulating policies, allocating resources, and presenting annual budgets that account for the value of natural, human, social and cultural capital — essential components of Bhutan's true wealth — *in addition to* that of manufactured and financial capital captured in conventional accounting mechanisms. Thus, the new National Accounts will eventually produce a new form of budget estimates and lay the foundations for a new economic paradigm that 'values what matters'. This recognises that natural, human, social, and cultural capital are not only national assets but key preconditions of physical and mental wellbeing and happiness.

Natural capital includes natural resources like forests, water sources, and soils, and the ecological services they provide. For example, forests provide vital life support services in regulating the climate, sequestering carbon from the atmosphere, protecting watersheds, preventing soil erosion, providing habitat for many species, and more. Unlike GDP-based accounts that narrowly value forest services primarily for the market value of the timber they provide, Bhutan's new full-cost National Accounts will value the full range of forest functions and assess the health and value of forests according to the degree they can provide those ecosystem services optimally.

Human capital includes the health and education of the populace, social capital assesses the strength of social networks and the safety, security, and vitality of communities, and cultural capital includes the knowledge and practice of the country's arts, languages, and culture. The new National Accounts will acknowledge that these non-material assets are as subject to depreciation as manufactured capital, and that they also require re-investment to restore and enhance their value. Since depreciation can occur due to both depletion (quantitative diminution) and degradation (qualitative decline), the new accounts will also include qualitative valuations, such as species and age diversity and other dimensions of forest quality.

By contrast, conventional national accounts assess a nation's wealth primarily in terms of the value of built or manufactured capital such as equipment, machinery, and buildings, and the value of financial capital in the form of financial assets and liabilities. They include only very limited elements of natural capital, like timber, land values, and subsoil assets like oil and minerals, and they ignore most dimensions of human, social, and cultural capital.

The omission in GDP and related conventional accounts of these key measures of health, environmental sustainability, quality of life, equity, and economic security make it a misleading and delusional statistic when policy makers mistakenly use it as an indicator of progress. In fact, the GDP counts all spending as a contribution to economic growth, regardless of whether that spending signifies an improvement or decline in wellbeing and happiness. For example, money spent building and maintaining prisons as a result of increased criminal behaviour makes the GDP grow, and is thus conventionally counted as economic gain even though it clearly reflects a depreciation of social capital and decline in national wellbeing. In the United States, for example, more than $7 billion a year is spent building new prisons and $35 billion maintaining those prisons to incarcerate one in 99 Americans — 25% of the world's prison population — hardly an indicator of social health and wellbeing despite its considerable contribution to national GDP.

The purpose of the new National Accounts measurement system is to provide more accurate signals of national wealth, prosperity, and wellbeing through a comprehensive set of measures that can properly identify our strengths so that we can build on them and protect them rather than take them for granted, and that can identify our weaknesses so that we can work to overcome them as soon as we detect early warning signals. Thus, the new National Accounts, using the best available data and measurement methodologies, are intended to provide policy makers with practical and realistic tools to assess the nation's true wealth, to measure progress towards genuinely sustainable prosperity, and to provide the evidence needed to formulate GNH-based policies that enhance the wellbeing of citizens.

In the long term, what will this new accounting system mean in practice? To give just two examples: When Bhutan presents its annual budgets, it will also start to account for the health of its forests and other natural resources like water. And if there has been a bad year of forest fires, for example, then the consequent forest loss will be counted as a depreciation of natural wealth, just as depreciation is presently calculated when accounting for the value of built and manufactured capital like factories, cars, and equipment. And if trees are planted or additional acreage designated as a protected area, that will count as an investment in natural capital, just as we presently account for investments in built capital like purchase of new machinery.

Taking a human capital example, preventable illnesses (and the consequent health care costs) would be figured as costs to the economy rather than such health care expenditures being misleadingly counted as economic gain. For example, as indicated by research conducted by Bhutan's National Statistics Bureau that estimated the costs of alcoholism to the economy to Bhutan, it will be possible to see preventive expenditures designed to reduce alcohol abuse as worthwhile investments in human capital (rather than simply as costs, as in the present flawed national accounting systems.)

In other words, budgets and accounts will not look the same in an expanded capital accounting system, but they will definitely provide a much more accurate picture of Bhutan's prosperity and wellbeing when total wealth and the full benefits and costs of economic activity are properly considered.

Perhaps most importantly, Bhutan's new national accounts will reflect all the key pillars and dimensions of Gross National Happiness, so that the country can truly chart a balanced path forward for the benefit of all its people. And because the new accounting systems are not only useful for this country but are universally necessary in order to value and protect vital ecosystem life-support services and natural and cultural diversity worldwide, Bhutan's development of the new accounts will certainly be a gift to the world from which many other countries can learn. Being 'first' in this field will also provide long-term economic opportunities for Bhutan to become a true laboratory and learning centre that will attract representatives of many other nations.

It is now widely accepted universally that the time is ripe for a new system of accounting that assigns value to natural, human, social, and cultural capital and registers their depreciation or degradation as costs. This new system of measuring progress, which the world so urgently needs, will naturally result in policies that shift behaviours towards sustainability and that create a society that nurtures the wellbeing of individuals, families, communities and the natural world. Indeed, there have already been shining examples, both in Bhutan and globally, of enlightened policy making that reflects the fundamentals of holistic thinking, and these can be supported and strengthened by the new accounts.

Referring to the importance of valuing natural capital, Bhutan's recent Rio+20 submission to the United Nations remarks:

> Full-cost national accounts will… show us clearly that our economy is only as healthy as the ecosystem services and natural resources that sustain our life on earth and which we need to power our economy. If we destroy our soils, forests, water, and other natural wealth, which provide invaluable services to our people, our economies and our people will die. And so our national accounts will value our natural capital fully, and properly account for the impacts of economic activity on nature's services. Based on such evidence (currently missing in our conventional accounting mechanisms), the new sustainability-based economic paradigm will create an economy in full harmony with nature.[3]

This prospectus, written especially for Bhutanese civil service professionals and policy makers, is a first step in attempting to explain a few of the purposes and key assumptions, principles, and structural foundations of the new National Accounts. It also attempts to demonstrate the potential utility and practical relevance of these full-cost measures to policy formation in the current economic conditions and into the future. It discusses the differences between indicators and accounts and why both are essential, and it cites examples to show how the new full-cost accounts might inform policies. Although this is definitely not intended as a comprehensive methodological instruction manual, it does provide a few select examples of the types of methodology needed to construct full cost National Accounts.

Specifically, the prospectus outlines in more detail the flaws inherent in reliance on conventional measures of progress based on GDP and economic growth statistics, and contrasts those limited measures to the new system of measurement. The new National Accounts critique of GDP-based measures does not propose either replacing the GDP or revising the GDP to account for social and environmental benefits and costs. It is important to emphasize here that there is nothing wrong with GDP, and no need for its revision or adjustment, *so long as* it is used for the purpose its architects intended 70 years ago — namely to measure the size of the market economy. GDP performs that function very well and in a remarkably detailed and comprehensive way. The problem arises only

when GDP is misused for a purpose never intended — namely as an indicator of prosperity, progress, and wellbeing. Therefore the purpose of the new National Accounts is both to replace the misused GDP as a measure of wellbeing and progress, and to restore the GDP to its proper place as a measure of the size of the market economy.

The idea that economic growth is good regardless of what is growing — whether schools, playgrounds, debt, disease, environmental degradation, social unrest — has dominated economic thinking and informed policy in the industrialised world since the Second World War. In 1944, world leaders gathered in Bretton Woods, New Hampshire, in the United States, to create the growth-based economic paradigm that institutionalized the GDP as the global measure of wellbeing, progress, and prosperity, and established institutions such as the World Bank and IMF to manage a system predicated on limitless growth. However, in the last two decades, growing awareness of resource limits unknown in 1944, and concomitant global dissatisfaction with this delusional paradigm, has led to significant headway in the development both of indicators that measure real progress towards a wide range of important social, economic, and environmental objectives and of accounts that include valuations of natural, human, and social capital. This burgeoning understanding of the interdependence of social, economic, and environmental factors in development and of the interrelated nature of reality challenges the materialist assumption implicit in the growth-based view of wellbeing.

The prospectus also discusses the use of the GNH Index and other indicators and data sources as the foundations upon which the new National Accounts will build an accounting framework and system of economic valuation. This additional layer of economic valuation will make Bhutan's GNH measurement system markedly different from other wellbeing measurement systems that rely on indicators alone. This is by no means a dismissal of other international wellbeing indicator systems, all of which have played a crucial role in moving us beyond the narrow, economic growth-based indicators of progress that have too long served as a misleading proxy for societal wellbeing and progress and thus skewed policy formation in entirely unsustainable ways. Those wellbeing indicator systems have laid a firm and important foundation for the new measurement methods.

At the same time, these wellbeing indicator systems have major limitations in their capacity to influence policy — not because they are conceptually flawed or methodologically unsound, but because they undertake only one component of the measurement challenge and do not effectively penetrate the dominant GDP-based economic paradigm predicated on the assumption of limitless growth. To provide accurate and effective guidance to policy makers, it is essential to have both a comprehensive indicator framework that assesses genuine ***progress*** and trends over time, and a full-cost accounting framework that assesses ***value*** and the true benefits and costs of economic activity. As the following analysis demonstrates, both forms of measurement are essential in policy formation, and it is this dual approach that distinguishes Bhutan's GNH Index and new National Accounts from other measurement systems that rely on indicators alone.

This prospectus is by no means "comprehensive" in the sense of covering all of the detailed methodologies, data sources, and other considerations involved in each indicator, accounting, and costing exercise. Although more work is needed in this field, including improvements in data sources and methodologies, tremendous strides have been made globally in the last three decades in both data collection and measurement methods, so that it is now possible to identify, and in many cases to quantify, the true value of natural, economic, social, and cultural assets, and the full benefits and costs of economic activity. This is very good news. What was once just a concept and an aspiration is

now feasible and measurable, and there is no barrier for a nation like Bhutan (or any other) to construct, adopt, and implement the new indicator and accounting tools as practical guides to policy.

This prospectus is only one facet of what is needed to develop, adopt and use the new National Accounts properly. Building technical capacity in full-cost accounting methods is also extremely important. Full-cost accounting refers to a form of cost-benefit analysis that includes environmental and social benefits and costs. Where possible, it attempts to monetize the value of non-market goods and services that are omitted from standard accounting procedures in order to demonstrate that such non-market goods and services do have real economic value. Thus, the full cost accounting approach can provide a more comprehensive description of reality than is possible with the narrow, current-income approach of the GDP. In the long-term, building technical capacity will partially need to be accomplished by offering new courses and training programs, and by restructuring university economics courses to include these methods and to adopt a more holistic approach that recognizes the social functions of the economy and its dependence and impact on the natural world.

However, in the short-term, international full-cost accounting experts have offered to help to create the new National Accounts in Bhutan. For instance, the Institute for Sustainable Solutions at Portland State University[4] will work collaboratively with RGOB agencies to begin incorporating natural, human, and social capital measures into the new National Accounts of Bhutan. To this end, world-renowned experts in this field, Dr. Robert Costanza (co-founder of the discipline of ecological economics)[5] and his team have begun to train civil service professionals and policy makers in Bhutan in full-cost accounting methods — especially those related to natural resources and ecosystem services — and in integrating these methods into the new National Accounts.[6]

In March 2011, Dr. Costanza and his colleagues Dr. Ida Kubiszewski and David Batker conducted a workshop in Bhutan on valuing natural resources and ecological services, which was attended by more than 70 representatives from a wide range of relevant government ministries and agencies, plus select university faculty, and representatives of non-governmental organizations. At the end of the workshop, the participants drafted a statement of recommendations, which included in part:

> Natural, Social / Cultural, and Human capital assets and their contributions to sustainable human wellbeing should be fully integrated into the National Accounts. This is an innovative endeavour that would benefit not only Bhutan, but would also serve as a model for the rest of the world. Bhutan should host an international gathering to build consensus on this new integrated system of National Accounts.[7]

During the workshop, the National Statistics Bureau (NSB) director clarified that the proposed new GNH Accounts will *not* be a set of satellite accounts "on the side" of the existing conventional accounting system, but will become *the* new System of National Accounts for Bhutan.

In addition — with the approval of the Prime Minister, NSB director, GNH Commission, and other workshop participants,— it was agreed that the GNH Commission would coordinate the entire initiative to revise and expand the National Accounts to include natural, human, social, and cultural capital. Not only is this initiative entirely in line with the GNH Commission's mandate to develop Bhutan according to GNH principles and values, but the new accounts and measuring tools will enable the GNH Commission to make ever more informed evidence-based decisions in its own planning processes. As well, the GNH Commission is a cross-cutting agency whose inter-sectoral

approach is fully consonant with the multi-disciplinary approach of ecological economics and of the proposed new comprehensive National Accounts.

The NSB director offered that the role of the NSB will be to collect, compile, assemble, and process the necessary data from each of the agencies. In other words, NSB will act as a central clearing house and production agency for all the assembled data. The initial collection of these data will be an activity of each of the agencies involved, which will require training in the new valuation methods to help identify existing data sources and new data needs. In many ways the data providers depend as much on the data users to identify data needs, gaps, and required improvements, as the users depend on the providers, though there is always a temptation for the users (focussed on content and meaning) to "blame" the providers for data inadequacies. Recognition of social and environmental reporting as a *mutual* and *co-operative* exercise and process shared between reporting and data collection agencies is therefore crucial for the success of these new indicator efforts.

Dr. Costanza and his team have kindly agreed to conduct regular hands-on, problem-solving courses that will gradually build the new full-cost National Accounts over a period of five years. The initial goal will be to undertake some very specific assessments of natural capital assets and ecosystem service values in a small number of key focus areas in order to provide experience in methodologies, concepts, and data requirements and use, including building on prior valuation work others in the field have done and extrapolating the values for Bhutan. The first such preliminary economic valuation of Bhutan's ecosystem services has been completed, and further refinements and improvements will be undertaken as the work progresses.

It was also decided in March-April 2011 that the new National Accounts training courses will be geared primarily to civil service professionals from the various agencies that would be most directly involved in collecting and analysing data for the new valuations of natural resources and ecosystem services. The courses will also include RUB (particularly CNR) faculty, who will be freed up to undertake this training and who will then pass along what they learn to students in new ecological economics modules or courses. Some Portland State University faculty and students will also participate. Dr. Costanza and his team have also offered to provide ongoing guidance on the particular methodologies used for each set of accounts, as needs for such methodological guidance arise or emerge naturally from the initial efforts to apply full-cost accounting methods in practice.

In addition, Bhutan's Rio+20 submission to the United Nations outlines a plan to globally replace the present out-dated and unsustainable economic measurement system — based on limitless growth and GDP measures — that simply no longer works either for the planet or for people. Calling for a new "Bretton Woods", the Bhutanese submission invites "the nations, economists, and ecologists of the world to come together in hammering out a new international consensus on a new sane, sustainability-based global economic paradigm, based on the best available scientific and expert knowledge."[8] The submission acknowledges that the process will take two years of hard work, which will culminate in 2014 with Bhutan offering to host the global gathering that will adopt the new protocol and genuine sustainability-based economic paradigm that will officially replace the 1944 Bretton Woods 'consensus'.

Currently, there is no broad consensus when it comes to the design and structure of a new expanded indicator and accounting system that takes ecological and social variables into account. Many groups all over the world are working on some version of it, but these versions all differ in various ways. As a result their work does not carry much weight when held up against the GDP, which is measured in

the same way everywhere. There is now an urgent need for a new global consensus for a sustainable economic future with its appropriate measures and institutions, so that there are comparable international standards.

The comparison with Bretton Woods is particularly significant at this moment in history, not only because it was the occasion where the GDP was entrenched, but because that post-war conference was also preceded and prompted by major international crises that signified the decline of the previous world order — at that time the Great Depression and Second World War. Similarly, the major global financial collapse of 2008 (completely unpredicted by conventional economists) utterly discredited conventional economic thinking, while climate change presents a threat to human existence on the planet arguably even greater than that posed by the last great war. Together these two current factors — economic and ecological — represent a new watershed juncture in history that clearly indicates the urgent need for a new consensus, institutions, progress measures, and accounting systems based on sustainability principles and properly valuing the ecological and social systems on which human survival depends.

As Dr. Costanza noted: "We have to change fundamental goals worldwide in line with those that are already accepted here in Bhutan."[9] This is the reason he feels Bhutan would be an ideal convener for this very important international gathering, since it already has both the political will and the underlying development philosophy that are consonant with the aims of the new economic paradigm. It will be important for a sovereign nation state to be the convener, and it will be particularly significant for that convener to be a developing nation like Bhutan rather than an industrialized one. Such a gathering will be essential to drive the political will worldwide in the direction of the required shift in goals, thinking, economic assumptions, measures of progress, and institutions.

The political will that Dr. Costanza mentioned as being notable in Bhutan is now required to adopt and implement the new indicator and accounting systems in practice in order to demonstrate their feasibility, and to use them actively as Bhutan's core measures of happiness and valuation, and as the evidence base for new policy. Bhutan is, in fact, ideally suited to take that leap. Through its GNH development plan and policies, GNH Index, and other GNH value-based initiatives, Bhutan has indicated its willingness to be on the forefront of the new integrated development path. Thus, as noted, the Prime Minister has already made an explicit commitment to move to an expanded capital system of valuation — the new National Accounts — which in itself places Bhutan well ahead of other nations in this field.

In sum, we are building a new economic paradigm, a new model of development, new measures of progress, and new institutions based on the vision of GNH — genuine wellbeing and a sustainable future — recognizing planetary boundaries, acknowledging that quality of life and social capital are often negatively affected by growth, and properly accounting for the value of nature and of our human and social wealth. The economic efficiency so central to the old model will still be a primary concern in the new model, but that efficiency will go far beyond the production of marketed goods and services to account, for example, for the efficiency with which each unit of nature's resources can be used without depleting their capital stock or quality. Thus, the new model will include the value of non-market goods and services, will account properly and accurately for the full impact and effects of different kinds of economic activity, and will incorporate the value of natural and social capital to achieve true distributive efficiency.

Similarly, while the old model focuses almost exclusively on private property rights, the new model balances property rights with full acknowledgement of the value of common property like the atmosphere. The new paradigm also ensures that property rights are appropriate to the nature and scale of the system (rather than spurring excess consumption by a few at the expense of nature, the poor, and other species as at present), and links rights altogether with responsibilities. In sum, the new model will by no means toss out key concepts like economic efficiency and property rights that are bulwarks of the present economic paradigm, but will situate them in a larger context that properly accounts for natural and social capital and for distributive impacts.

Indeed, the new model is entirely in line with Bhutan's own deepest and most cherished values and traditions. The country's ancient spiritual traditions command profound respect for all living beings of all species, fully acknowledge the interconnected nature of all reality, and therefore recognise that human beings cannot exist or survive for an instant without nature's services. Indeed, we cannot claim to be a GNH country if we rely on GDP-based national accounts that deny the value of nature's services, and until we develop new GNH-based National Accounts that properly value nature and human, social, and cultural wealth.

- Why go beyond the Gross Domestic Product (GDP)
- A new paradigm: The new National Accounts
- Summary of policy uses of the new National Accounts

## 1. Measuring Bhutan's true wealth

*It is ideas that determine the direction in which civilizations go. If you don't get your ideas right, it doesn't matter what policies you try to put in place. The policies will backfire, because the ideas that dominate will not be the right ideas. You have to begin with the ideas—then you can simply go ahead and put them into effect.*

– John Ralston Saul[10]
The Second International Conference on Gross National Happiness

Measurement tools that are used to assess progress towards Gross National Happiness, such as the GNH Index, reflect the kind of society in which we aspire to live. Most of us agree that we want to create and nurture healthy, happy, and sustainable societies with social, economic, cultural, and physical environments that enhance wellbeing — for our children and our children's children and for the sake of all species and the natural world itself.

When we measure GNH progress, therefore, we need to assess whether the people of the Kingdom of Bhutan are better off or worse off than they used to be — not just materially or based on how fast the economy is growing — but in terms of their overall wellbeing. To gauge whether Bhutan is making genuine progress, we must account for the health and security of the population; for people's livelihood security and educational attainment; for the strength, peacefulness, and cohesiveness of Bhutan's communities; for the quality of the country's environment and the health of its natural resources; and for how income, resources, and opportunities are shared among different population groups. Those basic markers of wellbeing are universal and apply to all human societies — traditional, tribal, modern, and post-modern.

Those measures require that we go beyond the current produce-and-spend accounting system, which is reflected in GDP (Gross Domestic Product) measures, to a full-cost measurement system that properly and accurately reflects the social, cultural, and environmental benefits and costs of economic activity. This more comprehensive and meaningful information, which in fact measures true wealth, can then be used to inform policy and shape an economic infrastructure capable of supporting future generations and of ensuring long-term sustainable prosperity in harmony with the natural world. The Kingdom

of Bhutan is planning to do just that: it is poised to become the first nation in the world to move beyond GDP-based accounts and measures of progress to a full-cost measurement system in a new system of National Accounts.

From the new National Accounts perspective, value should be explicitly placed on human, social, cultural, and natural capital — which are national assets and integral components of our national wealth — in addition to the built or manufactured capital conventionally counted in the national stock accounts.

Conventional national stock accounts, which value built and financial capital, count primarily the monetary value of produced capital like equipment, machinery, and buildings, and of financial assets and liabilities. They also count certain elements of natural capital like the market value of timber, agricultural land, and mined subsoil assets like oil and minerals. But they ignore the value of most dimensions of human, social, and cultural capital and of natural capital stocks that provide vital life-supporting ecosystem services — which, in effect, gives them a value of zero. They also exclude qualitative valuations of these expanded capital stocks like forest quality or depth of knowledge of cultural practices, which they also implicitly value as zero.

Even though our market economy is entirely dependent on through-puts from the natural world, our current conventional economic paradigm and accounting system does not include natural inputs (flows of materials and energy from natural sources and environmental services), sinks (waste outputs, atmosphere for example), the biophysical cycles that we depend on for human existence, or the earth as a living system. Aside from the timber value counted in the conventional national stock accounts, for example, forests clearly have value in regulating the climate, sequestering carbon from the atmosphere, protecting watersheds, preventing soil erosion, and providing habitat for many species — none of which have value in the conventional accounts. Since these assets clearly do have critical value both for our survival and for the health of the market economy, such an arbitrary zero value assignation is clearly inaccurate and misleading.

Similarly, human, social, and cultural capital include also include assets that are vital both for the effective functioning of the market economy and for human happiness and wellbeing. For example:

- The unpaid work done in households — which is invisible in the conventional market-based accounts that include only paid work — includes the child-rearing, food preparation, and sustenance required by a healthy labour force.
- The unpaid work of volunteers provides vital community services — including fire-fighting and rescue operations, clean-up campaigns, parent support to schools, support of religious and cultural practices, assistance to the elderly, sick, disabled, and youth, and more — all of which improve our quality of life. Indeed, without such services — again invisible in the national accounts — they would have to be replaced for pay if our living standards were not to decline drastically.
- Cultural capital contributes strongly to social cohesion and a sense of belonging, identity, spiritual sustenance, meaning in life, and inter-generational respect, without which citizens may find themselves rootless and alienated;

- A healthy population — a key dimension of human capital — is essential to both human wellbeing and an efficient market economy, which will suffer from worker absenteeism, tardiness, fatigue and inefficiency, and high health care costs due to ill-health; and
- Strong social networks — the key dimension of social capital — strengthen trust and reduce the likelihood of crime, which is often the consequence of alienation and a break-down in social cohesion, and which results in high costs to individuals, communities, and government.

These few examples of the importance of natural, social, cultural, and human capital suffice here to indicate their economic and social value, and the necessity of explicitly recognizing that value in any inventory of national wealth. Without such explicit recognition we take these assets for granted, remain unaware of their depletion or degradation, and fail to take remedial action until it is too late.

What we measure, value, and count is what gets attention in the policy arena. In a very real sense, therefore, our bewilderment and puzzlement at higher crime rates and substance abuse, youth alienation, environmental and cultural degradation, rural-urban migration, and disintegration of village life are the consequence of our failure to value natural, social, cultural, and human capital properly and, instead, our single-minded focus on narrow market values and the valuation of material capital alone.

These failings are not the fault of the Kingdom or government of Bhutan. We have inherited the present distorted and misleading measurement and accounting system from the so-called "Washington Consensus" that emerged from the 1944 Bretton Woods conference, which enshrined GDP as the global prosperity measure, and which established institutions like the World Bank and IMF to manage a materialist, consumer-driven economic growth-based economic system devised before the world had any real knowledge of natural resource limits.

Bhutan's new holistic and integrated National Accounts, which will account for the country's true wealth — natural, social, human, cultural, and manufactured — are nothing less than a complete overhaul of that out-dated and now dysfunctional Bretton Woods system through establishment of the foundation and accounting framework of a new wellbeing and sustainability-based economic paradigm.

In summary, the existing conventional capital accounts primarily count the value of:

- Built and financial capital: infrastructure (buildings, roads, houses, factories, machinery, equipment, and manufactured goods) that make up the material structure of society, and financial assets and liabilities;

Whereas Bhutan's new expanded capital accounts will include the value of:

- Natural capital: the land and natural resources, including soils, forests, water, air, and other species and life forms, which the earth and its atmosphere provide, including ecological systems and life-support services
- Human capital: the physical bodies of individual humans, their health and education, and the information/ knowledge stored in their physical/ spiritual bodies;
- Social capital: the web of interpersonal connections and networks, institutional arrangements, rules, and norms that facilitate human interactions;

- Cultural capital: well-defined by Statistics New Zealand as "the set of values, history, traditions and behaviours which link a specific group of people together."[11]

This expanded capital system framework generally uses a five capital model (to include natural, social, human, built, and financial capital values). That framework, which is increasingly favoured by economists seeking to remedy the now well-acknowledged flaws of conventional GDP-based accounting systems, often does not include cultural capital, or else includes it within the parameters of social capital. However, because the promotion and preservation of culture is one of the four core pillars of GNH, it makes sense for the Kingdom of Bhutan to adopt a six capital model that includes cultural capital.

New Zealand is an example of a nation that has recommended adoption of cultural capital as a separate component of its accounting system, because the preservation of Maori culture has become a high national priority. For example, the remarkable resurgence of Maori language in the last 25 years, after teetering on the brink of extinction, is a powerful testimonial that dedicated investment in cultural capital can yield a high return (to use accounting language), and that cultural assets can not only be preserved but strengthened in the most creative ways. The Maori instituted "language nests" in which toddlers were immersed in Maori language from a very young age. Since language carries knowledge, Maori cultural institutions, practices, traditions, and even political assertiveness have also seen a strong and inspiring revival in the last two decades concomitant with the language revival. In recognition of this new reality, Statistics New Zealand has therefore recommended consideration of a six capital model that includes cultural capital.

Natural, human, social, and cultural capital are just as subject to depreciation and in need of re-investment as manufactured or built and financial capital. If a forest is cut down or degraded, that is a depreciation of natural capital as surely as machines in disrepair or an unsafe bridge reflect a depreciation of manufactured or built capital. Similarly, a sick and uneducated populace reflects a depreciation of human capital; higher crime rates reflect a depreciation of social capital; and a loss of native language speakers, traditional wisdom, or knowledge of traditional arts and crafts reflects a depreciation of cultural capital.

By the same token, investments in health promotion, educational opportunities, and programs for youth in need will no longer be regarded simply as "costs" subject to government cuts at times of fiscal restraint, but rather as investments in human and social capital that will have a rate of return in improved productivity and avoided costs at a later stage. Similarly, environmental protection and restoration, skills training, establishment of youth counselling and rehabilitation facilities, preserving indigenous languages, training young Bhutanese in traditional crafts, and wearing the gho and kira to work can rightly be seen as investments in the natural, human, social, and cultural capital that constitute essential components of the nation's wealth.

This long-term view of depreciation and return on investment is part of standard accounting procedures for businesses assessing investment needs in plants and equipment. Yet the world presently takes a decidedly short-term view in relation to the health of its natural and social assets. And governments presently have no officially accepted accounting systems or methods for assessing the value of their nations' natural, human, and social wealth, for

calculating its depreciation, or for gauging the need for re-investment. Consequently, they have no early warning mechanisms that can prevent serious resource collapses. New satellite accounts, indicator sets, and social report cards that fail to challenge this existing double standard or to provide alternative accounting procedures for our human, social, and natural assets, will have only limited impacts on policy.

In short, we need to expand our present narrowly based balance sheets or stock accounts, which ignore and therefore devalue our true wealth, into a full capital accounting system that properly accounts for the value of all our assets. At the March 2011 Thimphu workshop on valuing natural capital and ecological services, the approximately 70 participants collectively and unanimously recommended that natural, social, cultural, and human capital assets and their contributions to sustainable wellbeing should be fully integrated into the National Accounts. In fact, there were no opinions to the contrary expressed.

## 1.1 Why go beyond Gross Domestic Product?

Globally, nations currently measure their progress and gauge their wellbeing according to a narrow set of materialist indicators — their economic growth rates. When the gross domestic product (GDP) is up, it signifies that the nation's economy is growing, which is thought to indicate the it is prospering and doing well. Conversely, when the GDP is down, this signifies that the economy is not growing and it is thought the nation is therefore not doing well. Even small changes in the GDP and related market statistics currently have great weight in policy arenas, while vital social and environmental factors, which also profoundly affect the economy and general wellbeing, remain invisible.

GDP-based measures of progress have several key limitations and problems that make them inadequate measures of human prosperity, progress, and wellbeing. For example, to name a few, GDP:

- measures only gross income and market-based economic activity;
- counts all market-based economic activity as being positive, regardless of whether it contributes to or reflects a decline in wellbeing, and it therefore does not separate out defensive expenditures that reflect increases in crime, sickness, pollution, resource degradation and other negative trends;
- does not count a wide range of positive activities that do contribute to wellbeing, such as the unpaid work contributed by volunteers and in households; and
- does not take income distribution into account.

These flaws are important to acknowledge, because discussions of Bhutan's Gross National Happiness philosophy often advance that concept primarily as a moral and ethical imperative, rather than as an essential corrective to a deeply flawed system. In that regard, it is important to recall that the term Gross National Happiness was first coined by His Majesty the Fourth King of Bhutan as a direct counterpoint to Gross National Product. To properly understand His Majesty's proclamation that GNH "is more important than" GNP, it is therefore essential to explore the limitations of GNP (or GDP as now used). In particular, it is necessary to understand that, while there is nothing wrong with GDP when

used simply to measure the size of the economy, it is incapable of correctly assessing progress, prosperity, and wellbeing — the way it is generally used today.

As well, comprehending fully and properly the shortcomings of current market-based measures of progress will naturally point to a viable alternative conceptual framework, and to the selection of key indicators, values, and appropriate methodologies. That awareness in turn will enable Bhutan to strengthen, deepen, and clarify its own moral and policy commitment to GNH, and to exercise a global leadership role in effectively challenging the existing dominant materialist measures that are currently used globally to assess societal prosperity and progress. As well, pioneering the new progress measures will enable Bhutan to justify its adherence to GNH not only on moral but also on analytical grounds that effectively challenge the validity of market-based measures of progress. In all these ways, the following analysis of GDP measures functions as an essential pre-requisite to development of the new economic paradigm and accounting mechanisms.

First, the GDP can only tell us about the overall size of the market economy. It is not an indicator of societal progress and was never intended to be used as a measure of wellbeing. The GDP is not designed to distinguish between those economic activities that are beneficial for society and those that signify a decline in wellbeing. It is a crude market measure that narrowly accounts for the quantitative size of the market economy but not for the social, human, cultural, and natural assets that are essential components of our true wealth as a society.

The GDP aggregates the economic value of the total quantity of all goods and services produced in the market economy, and also reflects the total amount of money earned and spent in the market economy. It makes no distinction between a ngultrum spent on a handwoven gho or a ngultrum spent building a new prison. In fact, activities that degrade our happiness, like crime, pollution, war, stress, sickness, and environmental degradation, all make the GDP go up simply because they cause money to be spent countering those ills. The more trees we cut down, the more alcohol, junk food or Prados we buy, the more prisons we build, the more we consume — the more the economy grows.

The GDP assigns no value to our natural world or to the vital life-support services it provides. Therefore, we actually and mistakenly count the depreciation of our natural wealth as economic gain. This is because the GDP only counts what we *extract* from our natural resource base and send to market. It fails to account for the health and value of what we leave behind — in our forests, soils, watersheds, and atmosphere. Paving over a wetland, for example, counts as 'development' and produces a flurry of construction and other economic activity that contribute to GDP, but the loss of the wetland's vital ecosystem functions in nutrient cycling, flood control, water purification, waste treatment, and habitat provision remain invisible and register nowhere in our current accounting mechanisms.

As Repetto and Austin (1997) remark:

> A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers and hunt its wildlife and fisheries to extinction, but measured income would not be affected as these assets disappeared.[12]

GDP also ignores genuine contributions to wellbeing, like volunteer work and the unpaid work done in households, simply because no money is exchanged. And GDP tells us how much income is being produced in aggregate, but nothing about how that income is shared and distributed, so that many people might be losing real income and the gap between rich and poor might be growing (thereby threatening social cohesion) even while GDP continues to grow.

The GDPs omission of key measures of environmental sustainability, health, quality of life, equity, and financial security make it a misleading and even dangerous statistic when it is misused as a measure of progress. Indeed, because it is a gross rather than net accounting system, registering debt-driven spending as economic gain without considering declining capacity to service the debt, GDP is misleading even as a basic economic indicator. For example, GDP failed to send key warning signals of the 2008 financial crash and resultant economic crisis, like the fact that much of the growth in GDP in the U.S. since 2001 was the result of people borrowing money against their homes to make consumer purchases.[13] A sane accounting system that considered debt growth in relation to income growth could have predicted and even helped prevent the current ongoing financial and economic crisis.

Because GDP is not an indicator of either prosperity or wellbeing, for all the reasons outlined above and more, it should not be used to inform the making of policy. This was explicitly recognized and understood by the architects of GDP itself, like Simon Kuznets, Nobel Prize winning economist, who wrote half a century ago that to assess the welfare of a nation it is necessary to ask not how much the economy is growing, but *what* is growing.

It is important to note that this critique of GDP-based measures of progress does not propose either replacing the GDP or revising the GDP to account for social and environmental benefits and costs. Indeed, there is nothing wrong with GDP, and no need for its revision or adjustment, *so long as* it is used for the purpose its architects intended 70 years ago — namely to measure the size of the market economy. GDP performs that function very well and in a remarkably detailed and comprehensive way.

Also, adjusting the GDP to create a "green GDP" that subtracts environmental costs from GDP is not recommended here, although this method has been used elsewhere as a way of figuring environmental considerations into existing accounting mechanisms. However such a "green GDP" exercise remains misleading when used as a measure of progress, because it still starts from a GDP baseline, and is therefore still based on the fundamental assumption — which is questionable from a sustainability and ecological footprint perspective — that more production and consumption are necessarily beneficial..

In sum, the problem with the GDP arises only when it is misused for a purpose never intended — namely to measure prosperity, progress, and wellbeing. Thus, more comprehensive indicators of progress like Bhutan's new GNH Index serve to replace the misused GDP as a measure of progress while the purpose of Bhutan's new National Accounts is to provide a comprehensive assessment of the nation's true wealth. The GDP was not designed for either function, and is incapable of serving as either an accurate progress measure or an assessment of prosperity, wealth, and wellbeing.

By attempting to fulfill those functions, the GNH Index and the new National Accounts between them effectively restore the GDP to its proper place as a measure of the size of the market economy. In that role, the GDP will become much less important and will most likely not need to be calculated nearly as often as it presently is internationally — an unnecessary and expensive exercise that frequently mistakes short-term episodic fluctuations for long-term trends and thereby undermines rather than enhances market stability.

## 1.2 A new paradigm: The new National Accounts

Costanza, et al. have contrasted two different views of the economy as an "empty world" model — which corresponds to the conventional economic model devised at a time when the world was relatively 'empty' of human beings and their infrastructure — versus a "full world" model in which human beings and their creations have come to dominate the world and deplete its resources. The latter reality of modern times, they argue, requires the contrasting new sustainable development model described below.[14] The basic characteristics of each model are listed in Table 1 below, which is adapted from Costanza's "Stewardship for a Full World" to show how Bhutan's new National Accounts may fit into that new economic paradigm.

**Table 1. Characteristics of current and sustainable development models**

| A New Development Model | | |
|---|---|---|
| Basic characteristics of the current development model and an emerging model based on sustainable "ecological economics." | | |
| | **Current development model – "empty world model"** | **Sustainable development model: an emerging "green" consensus – "full world model"** |
| Primary policy goal | More: Economic growth in the conventional sense, as measured by GDP. The assumption is that growth will ultimately allow the solution of all other problems. More is always better. | Better: Focus shifts from mere growth to "development" in the sense of improvement in quality of life, recognizing that growth has negative by-products and more is not always better. |
| Primary measure of progress | GDP | GNH National Accounts |
| Scale/carrying capacity | Not an issue because it is assumed that markets can overcome any resource limits via new technology, and substitutes for resources are always available. | A primary concern as a determinant of ecological sustainability. Natural capital and ecosystem services are not infinitely substitutable, and real limits exist. |
| Distribution/poverty | Lip service, but relegated to "politics" and a "trickle down" policy: A rising tide lifts all boats. | A primary concern since it directly affects quality of life and social capital and in some real ways is often exacerbated by growth. |
| Economic efficiency/ allocation | The primary concern, but generally including only marketed goods and services (GDP) and institutions. | A primary concern, but including both market and non-market goods and services and effects. Emphasizes the need to incorporate the value of natural and social capital to achieve true allocative efficiency. |
| Property rights | Emphasis on private property and conventional markets. | Emphasis on a balance of property rights regimes appropriate to the nature and scale of the system, and a linking of rights with responsibilities. A larger role for common property institutions in addition to private and state property. |
| Role of government | To be minimized and replaced where possible with private and market institutions. | A central role, including new functions as referee, facilitator, and broker in a new suite of common-asset institutions. |
| Principles of governance | Laissez-faire market capitalism. | Principles of sustainable governance. |

Source: Adapted from Costanza, Robert. 2008. "Stewardship for a 'Full' World", *Current History,* 107. pp 30–35.

The current development model or "empty world" model of the economy, devised before awareness of natural resource limits, is what currently drives most public and private policies in the world. According to Costanza, the underlying assumptions of this model are:

- more is always better
- the economy can grow forever (scale is not an issue)
- poverty can best be solved with more economic growth (distribution is not considered to be important as it is assumed that a 'rising tide will lift all boats')
- nature is a side show

- private property is always best.

This model emerged during the Industrial Revolution and is based on various assumptions that were prevalent and made sense at the time. However those assumptions are no longer applicable to a world in which human population, activity, and infrastructure have mushroomed to an extent that exceeds the carrying capacity of the planet. At the time of the Industrial Revolution, the global population was relatively small, natural resources were abundant, and the main concerns were adequate access to infrastructure and the expansion of an economy of marketed goods and services.

By contrast to the "empty world" model that emerged from the Industrial Revolution, the "full world" model must fundamentally be that of an ecological economic system, which:

- recognizes the reality that we live in a materially closed earth system
- recognizes that resources are finite
- values natural, human, social, cultural, and manufactured/ financial capital.

Whereas the "empty world" economic model assumes that these capitals are fully substitutable — e. g. increased manufactured capital can replace or substitute for a depletion of natural capital — the "full world" model recognizes that there is in fact very limited substitutability between the different capital forms. All are necessary in and of themselves, and they all contribute directly and in their own unique ways to human wellbeing. These different capitals complement each other and interact, so that there are both direct and indirect benefits when they act together to provide for human wellbeing. Costanza argues that there is also a growing recognition that human wellbeing is about much more than consumption, an equation more generally assumed in the "empty world" model.

None of this implies that economic growth is not important to countries like Bhutan, which not only have a small ecological footprint but still have a relatively low per capita income. The "limits to growth" argument applies particularly to countries and regions with very large ecological footprints and high per capita incomes. In a world of limited resources, a "steady-state" rather than growth-based economic model in the rich countries will create more space for growth and increased living standards in low-income countries. As well, lower-income countries like Bhutan can learn from and avoid many of the mistakes made in the West that have compromised environmental quality and social wellbeing, and instead carefully seek the type of development that is environmentally sustainable and equitably improves quality of life.

The conventional view is that the economy *is* the market, and the goal of the current economic paradigm is to increase consumption of goods and services in the market. Instead, based on a much more realistic view and understanding of human existence on the planet, and the "safe space" for that existence — the space within which the human economy can properly and effectively operate — the goal of the economy, says Costanza, should be to produce "sustainable human wellbeing."

**Value-based frameworks**

Every index or set of indicators is designed to measure progress towards defined goals or values, and is therefore normative by definition. The moment we talk about measuring progress, the inevitable question arises: progress towards what? And that question, in turn, can only be answered by some reference to societal vision — what kind of Bhutan do we want for our children 20 or 30 years from now?

It is frequently argued that the new wellbeing indicator systems are subjective, and that the GDP — which is not actually an indicator but an accounting system — and related economic growth statistics at least have the virtue of being "objective." But this is not true when the economic growth statistics are used to assess wellbeing and progress. In that case, they *are* value-based. Since the GDP measures increases in production and consumption, its value base is *quantitative* growth — with "more" simultaneously signifying "better". That notion may remain implicit, but it is there nonetheless — that more growth is a "good."

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.[15]

This distinction is vitally important for Bhutan's Gross National Happiness development philosophy. The term "economic growth" has mistakenly been used interchangeably in the past with the term "economic development", which can lead to confusion. Following Daly's definition of "development" as distinct from "growth" can help reduce the likelihood of such confusion.

The key issue here is that the normative framework of indicators of wellbeing and 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 new wellbeing and sustainability measures simply include "more" variables than the GDP and conventional economic statistics. But the new indices are not simply a way of cumulatively "adding" social and environmental factors. Instead, as the King of Bhutan's seminal statement on Gross National Happiness by contrast to Gross National Product indicated, the new measures must clearly represent a new and quite different social vision and set of values than those underlying the use of GNP or GDP as a measure of progress.[16]

### GDP language

The degree to which economic growth has become identified with wellbeing through habitual reliance on GDP-based measures has never been clearer than in the health and sickness language used to describe the 2008-09 economic collapse in the industrialized nations. Newspapers were full of references to the "sick" and "ailing" economy and the need to "inject" billions of dollars of fiscal stimulus into the sick economy in order to spur a

"recovery." The 'sickness', of course, is synonymous with a shrinking economy and decline in consumer spending, and the 'recovery' with renewed spending and economic growth. By contrast, the economic boom period of the previous decade and a half was characterized by a "robust" and "healthy" economy — terms unthinkingly equated with simple quantitative growth, regardless of whether that growth was fuelled by debt, resource depletion, and other liabilities.

Other favourite descriptors of the 2008-09 economic downturn that filled the commentaries included 'gloom', 'fear', 'panic', 'disaster', 'dire straits', 'dismal statistics', and economic sectors "under threat," with "disheartened" consumers plagued by 'resignation' and 'despair', as a "frightened population locks up its wallets" and "people hunker down for a period of austerity." These phrases were all culled from a single day's London newspaper in November 2008.

It is revealing to recall that when North Americans stayed home after the attacks of 11 September, 2001, one of the first messages from the U.S. President was to go out and spend money — as if the biggest ultimate threat was an economic slowdown. A front page newspaper headline two days after the 11 September attacks declared: "Shopping is patriotic, leaders say." As the rapid 'fiscal stimulus' mobilization of national and international efforts and money showed in 2008-09, economic growth has been so equated with societal wellbeing that it supersedes all other policy priorities.

Equally revealing is the language used to describe the "recovery" measures proposed and undertaken to "jump start" the ailing global economy in 2008-09. Here again are samples from the same November 2008 London newspaper:

- Following a fall in U.S. retail sales, measures are being considered to "keep U.S. consumers shopping."
- "Fiscal stimulus" is the basis of a "recovery" plan with the goal of "handing out enough money to get consumers buying and companies investing."
- Among the G-20 nations, there is now "a consensus about what is needed to put the global economy and financial markets back on track…[to] restore credit markets, keep slashing interest rates to stimulate growth and pour much more government money into fiscal stimulus packages."
- The long-term goal is to "reduce the likelihood that the global financial system will fall prey to another once in a lifetime catastrophe."
- Interest rates are being cut so that households and corporations will "borrow, spend and rejuvenate the economy."
- The goal of all this is to get the "economy booming, consumers spending [and the] stock market performing."
- The G-20 discussed "coordinated cash injections and tax cuts in order to kick start economic growth" and supported "using fiscal measures to stimulate domestic demand to rapid effect."
- Then IMF Managing Director, Dominique Strauss-Kahn, summarized the simple-minded view succinctly when he called on nations to pump 2% of their GDP into "raising domestic output growth" in order to stave off a severe global recession. He

said: "I welcome the emphasis on fiscal stimulus which I believe is now essential to restore global growth." (All above citations from *Times of London*, 17 November 2008)

The word "inject" (as in "inject billions of pounds into the economy") is of particular interest, as it really does conjure up the image of a sick patient desperately in need of a life-giving medicinal infusion. The United States, European, and other governments did in fact 'inject' billions of dollars into the 'ailing' economy — massive, indeed astonishing, expenditures approved with little debate and with an urgency and rapidity not seen in any other sphere — expenditures that predictably plunged those governments into ever deeper debt. For those who ever doubted the extent to which GDP growth has become equated in the public, policy, expert, and journalistic mind with societal health and wellbeing, the language associated with the 2008-09 economic collapse, along with the almost blind and entirely non-partisan adherence to the limitless economic growth doctrine, should dispel all doubts.

Predictably too, the frenzied fiscal stimulus of 2008-09 failed to stimulate in the longer term, precipitated the current euro crisis, and essentially replaced consumer debt with government debt. The failure of conventional economists to predict the crash and the failure of their subsequent remedies not only demonstrated the bankruptcy of the conventional economic paradigm but, more positively, laid the ground for a new economic paradigm in line with current 'full world' realities and no longer wedded to the unsustainable premise of limitless growth on a finite planet.

**GDP/ economic growth dogma vs. a balanced approach**

In sum, the fiscal stimulus 'remedies' for the 2008-09 crash clearly revealed the GDP/ economic growth dogma as the ultimate unifying bond of modern society, overcoming party and national politics to bring almost immediate consensus on required action, with virtually no limits to available funding. The health and sickness language above also reveals the extent to which GDP has morphed from an accounting mechanism to its total misuse as the ultimate indicator of wellbeing.

David Suzuki, renowned scientist and environmental advocate, has said that the only biological organism that shares our economic dogma of limitless growth is the cancer cell — which also thrives on unlimited growth till it destroys its host. We could add some other examples — like weeds or algal blooms that suffocate plants and water bodies. Suzuki's point is simple: In nature, limitless growth is inherently destructive. By contrast, he points out, nature always thrives on ***balance***. Plants, for example, do best when they have not too much water and not too little, not too much sunlight and not too little.

The "full world" sustainable development model, which is fully consonant with Bhutan's holistic and integrated GNH development model, is based on balance — in sharp contrast to the limitless growth assumption underlying the conventional economic paradigm and its GDP-based measures. Indeed GNH is intended precisely as a judicious balance between environmental, economic, social, and cultural objectives, with "good governance" as the primary tool to balance those priorities effectively.

The contrast between that sense of balance and the growth paradigm is reflected in the alternative accounting models. Assessing agriculture, for example, GDP only counts gross farm cash receipts, while the new National Accounts will balance those receipts against changes in the costs and expenses of farming and against farm debt. Unlike ***Gross*** Domestic Product accounting mechanisms (the name speaks for itself), the new National Accounts are simply a net accounting system that balances the outcomes of economic activity against its full range of benefits and costs — economic, social, and environmental. If an economic activity like coal-fired electricity generation produces costs in the form of greenhouse gas, sulphur oxide, and mercury emissions, then the inclusion of those costs in the accounts constitutes a net approach. By contrast, GDP only counts the benefits of electricity production while considering none of its costs.

The balanced approach of the new 'full world' economic paradigm and accounting mechanisms also indicates how policy makers can use the new National Accounts to predict economic problems and undertake timely remedial action, rather than being surprised at a sudden, and unforeseen, economic collapse. Instead of reporting only consumption, output, and income growth, as the GDP does, a net accounting system in the U.S. would have shown that the so-called economic 'boom' of the previous 15 years was largely debt-fuelled, and that debt growth had increasingly outpaced income growth in the past decade, raising serious questions about growing incapacity to service and manage debt. This is not rocket science or even more complicated than managing a simple household budget — in this case, the new National Accounts will simply balance income growth against debt growth and view the changing ratios over time.

Similarly, the new National Accounts will ***balance*** what we extract from our natural capital base with the health of our natural resource base — accounting as fully as possible for our natural wealth in forests, soils, water, and other resources. On the same logic as above, ecological debt is figured into the resource health equation just as consumer debt is figured into the economic health equation. The new National Accounts will even balance the approach to sustainability accounting altogether by balancing supply-side natural resource accounts with demand-side or consumption-based ecological footprint analysis and accounting of human demands on the environment.

In sum, the new National Accounts system is a ***balanced*** or 'middle way' approach that looks at both sides of any equation, and thereby provides far more accurate signals to policy makers than an extreme doctrine like limitless growth.

**Use of full-cost accounting and ecological economics in the new National Accounts**

As noted, the new National Accounts are based on the "full world" development model and a full-cost accounting, ecological economics valuation approach. Full-cost accounting refers to a form of cost-benefit analysis that includes and internalizes environmental and social benefits and costs. Where possible, it attempts to monetize the value of non-market goods and services that are omitted from standard accounting procedures. While such monetization draws policy attention to assets whose true value is otherwise ignored, monetization also has limitations that are discussed in detail in Chapter 3 below. The key point here is that the full-cost accounting approach can provide a more comprehensive description of reality than is possible with the narrow, current-income approach of GDP-based measures.

Ecological economics is a full-cost accounting system that is holistic and trans-disciplinary (putting together and cutting across a number of disciplines in order to understand the whole system), which distinguishes it from environmental economics — a sub-discipline of economics. Ecological economics literally means *management of the house*, and is concerned with an ecologically sustainable scale, socially fair distribution, and economically efficient allocation of resources. It is also concerned with quality of life, happiness, and wellbeing — human needs that go far beyond mere consumption and survival — and the opportunities to meet these needs through strengthening and investing in the capitals briefly described above.

Economic valuation of environmental and social assets, though sometimes disparaged by "purists" who believe such valuation demeans the inherent value of those assets, is actually a vital strategy to draw attention to true values by counting what really matters. In a world where budgets and costs greatly influence policy, assigning economic value to our natural and social wealth is a necessary strategy to garner policy attention. By ignoring the value of natural and social capital and the ecosystem and wellbeing-enhancing services they provide, GDP is in fact putting an arbitrary value of zero on these vital assets, which is far less accurate than attempting to assign a proper value and also treats these key assets as mere externalities that then don't get proper policy attention.

*Integrating* the new capital valuations into the new National Accounts means that natural and social capital valuations will not exist as separate stand-alone measures alongside the existing accounts. That would actually diminish their influence as mere "satellite" accounts and might even reinforce the notion that environmental and other benefits and costs are 'externalities'. As well, it would prevent meaningful analyses of the true benefits and costs of economic activity. On the contrary, the goal in Bhutan is precisely to *internalize* these so-called 'externalities' and thereby to transform the National Accounts and core measures of national wealth. In other words, natural, social, cultural, and human capital are *integral parts* of a nation's wealth and therefore must be fully integrated into the national balance sheets and accounts.

In this way, the new National Accounts will also reinforce the integrated GNH approach to development that does not focus narrowly on economic consumption alone, but fully recognizes the links between social, economic, and ecological realities. Indeed, entrenching GNH principles, values, and practices more completely and fully in the fabric of Bhutanese society is the fundamental context and purpose of the new accounts. Without such a transformation of the National Accounts, there is a real danger that GNH initiatives will be seen as separate from or inadequately linked with economic development processes and initiatives. In sum, economic valuation is very important not only to challenge the current under-valuation of our natural and social capital assets and services in GDP-based measures, but also to draw policy attention to their actual importance and true value as integral dimensions of a holistic GNH development approach.

The idea of measuring what really matters — the broader constituents of wellbeing and genuine progress — has been evolving over the last 40 years as policy makers have grown more aware of and more disenchanted with the limitations and indeed dangers of using the GDP as an indicator of progress. This growing awareness has led to the gradual development of new measures of population health, volunteer work, time use, social

supports, greenhouse gas emissions, air quality, and a wide range of other social and environmental dimensions of wellbeing and progress.

These diverse new data sources and the methodologies developed to track these variables accurately (including new survey tools, time diaries, GIS and other scientific monitoring tools) now make it possible to assess trends and progress in these areas more accurately and comprehensively than ever before, and to begin to value natural, human, and social wealth properly. In other words, it is not that the idea of going beyond GDP is new but rather than the data, tools and means to do so are now finally available.

As a result, the new National Accounts will be able to show crucial distinctions between the wider costs and benefits of economic activity that are invisible in GDP-based accounting mechanisms, and thus to make significant contributions to evidence-based policy formulation. Thus, for example, the new National Accounts will value the economic contributions of household and volunteer work, and of ecosystem life support services, and thereby point policy makers towards needed investments that will ensure the continued strength, maintenance, and effective functioning of these vital services. At the same time, the new National Accounts will count crime, pollution, sickness, and environmental degradation as costs not gains to the economy, and thereby point policy makers towards needed preventive investments that can avoid such ills and promote population health, safety and security, and environmental protection.

The reason it is so important to revise the National Accounts in these ways is simply that current accounting mechanisms send dangerously misleading signals to policy makers. Social and ecological detriments like crime, disease, and pollution do produce actual economic costs in the form of what economists call "defensive expenditures" that do not signify a net gain in societal wellbeing but are required simply to repair past damage and restore the status quo ante. Yet GDP misleadingly counts such defensive expenditures as economic gain without assessing whether society is better off than before the detriments occurred.

Essentially, the new National Accounts will simply link economic expenditures with actual social and ecological realities rather than regarding the economy as a closed box that exists for its own sake, as in the present system. In sum, the new National Accounts recognize the simple truth that the economy exists to serve the interests of people, communities, the nation, and the planet, which are inextricably linked. That recognition is the basis of a GNH approach to national accounting.

In these ways, the new National Accounts will provide a more accurate and realistic picture of how we are really doing as a society. From an accounting standpoint, the new National Accounts also begin to move towards a balance sheet of the country's actual human, social, economic, and environmental assets and liabilities that reflect, in part, the consequences of the long-term flows or trends that cause these assets to depreciate or increase in value.

In order to create this more comprehensive accounting mechanism, the new National Accounts assess the economic value of these assets by imputing monetary values wherever possible to the services provided by human, social, and natural capital, and by describing those values in other terms wherever monetization is not feasible. This process of monetization, which will be discussed in greater detail (along with its limitations) in Chapter

3 below, is very helpful in assessing value in this day and age, simply because financial structures, such as prices, taxes, government budgets, and monetary incentives continue to provide the primary cues for the actual behaviour of individuals, businesses, and governments. For example, financial incentives and penalties — the actual ngultrum value of which will be indicated by the new National Accounts — can be helpful inducements to changing behaviour, supporting and encouraging sustainable practices, and preventing and penalizing harmful actions.

To illustrate the utility of monetizing social and natural capital values, two Canadian examples are given here. Time use survey data in Canada pointed to a significant decline in volunteer hours nationwide, with fewer volunteers putting in longer hours in an effort to maintain services. Cumulatively, volunteer service hours per capita showed a decline of 10.7% nationwide. Yet this important trend, which directly undermines community strength and wellbeing by depriving communities of vital cultural, social, and ecological services provided by volunteers, has never been the subject of debate in any legislature in Canada, and the trend itself remains unknown to the vast majority of legislators. This is largely because no money is exchanged for volunteer work, and therefore the value of volunteerism is nowhere to be seen in the economic growth statistics, accounting mechanisms, and related measures of progress that policy makers reference.

Had the economic value of voluntary work been counted in the National Accounts, they would have revealed that this decline cost Canadians more than $2 billion in lost services. But because voluntary work is not valued or measured in the conventional economic accounts, the loss remained invisible and was ignored. A 10.7% decline in GDP would be called a depression and constitute a national emergency, and a similar decline in any industry would likely provoke major government intervention to prevent the collapse of the industry. Yet a decline of this magnitude in unpaid voluntary work did not register on the policy radar screen. That this work does have direct economic value is indicated by the simple reality that it would cost governments more than $50 billion to replace for pay the services to the Canadian economy currently provided for free by volunteers.

The dollar estimates given above are conservative as they do not include the indirect benefits of volunteerism like the value of a strong civil society. Nor, therefore, does the decline in the value of voluntary work and services in Canada reflect the hidden social and economic costs associated with a decline in civil society, which according to the literature, also leads to social unrest, alienation, higher rates of crime, drug abuse, and other dysfunctional activities. In sum, the invisibility of the benefits of volunteerism in our current accounting system and economic growth-based measures of progress ensures that a major decline in social capital in recent years remains off the policy agenda of Canadian governments. Bhutan's new National Accounts, by contrast, will account fully for the economic value of voluntary work in Bhutan, and thus make the benefits of volunteerism to the country fully visible to policy makers and to the general public.

Another illustrative example of the benefits of valuing non-market services deals with natural capital, which presently hardly registers in conventional accounting mechanisms despite being the source of most human economic wealth. The goods and services provided by an optimally functioning forest ecosystem, for instance, have been shown to be far more valuable than the immediate financial returns of clear-cutting and selling the timber from

that forest. Yet, when the ability of a forest to provide these goods and services (including climate regulation, carbon sequestration, watershed and soil protection, and habitat provision) is compromised, our economic accounting mechanisms should count those losses as costs, not gains, to the economy.

In our current GDP-based accounting systems, forests are only given a monetary value when they are cut down and the timber is sent to market. Forests are not valued for the other essential non-market services they provide when left standing. Thus, when a forest is clear-cut, GDP accounts only for what is extracted from our natural resource base, but fails to account for how much of the forest is left behind. This is like a factory owner selling off machinery and counting the proceeds as profit, regardless of the depletion of the capital base of production.

A detailed three-year two-volume study of Nova Scotia's forests found a massive depreciation in the value of those forests as a result of the almost total decimation through clear-cut harvesting of that region's old-growth forests (of which only 0.15% of original forests remain). The study revealed that clear-cut harvesting and loss of natural age and species diversity had resulted in major losses of valuable species, of wide diameter and clear lumber that fetch premium market prices, of resilience and resistance to insect infestation, of wildlife habitat (including decreasing populations of birds), and of forest recreation values (thereby adversely impacting nature tourism). The losses had also resulted in a decline in forested watershed protection and a 50% drop in shade-dependent brook trout; soil degradation and the leaching of nutrients that adversely affect future timber productivity; a substantial decline in carbon storage capacity and an increase in biomass carbon loss.

Despite the fact that this accumulated evidence represents a very substantial depreciation of a valuable natural capital asset, the loss remained invisible in conventional accounting mechanisms due to the fact that those vital ecosystem services were simply not counted or valued. That invisibility, in turn, ensured that the continued destruction of the region's forests received no policy attention, and indeed guaranteed policy inaction while the clear-cutting continued unabated. On the contrary, Nova Scotia's GDP annually recorded the timber from the felled forests as economic gain, providing no incentive to protect the myriad invisible and un-valued services of standing forests.

Had forest values been properly counted in the National Accounts, they would have revealed that Nova Scotia's forests had the potential to provide more than $1.8 billion annually in vital ecosystem services like climate regulation, soil formation, waste treatment, food production, biological control, and recreational and cultural values — far more than the value of the felled timber. The Accounts would have shown the annual cost of carbon released to the atmosphere through excess timber harvesting alone to be more than $20 million a year.[17]

Properly valuing the full functions and services provided by forests, as Bhutan's new National Accounts will do, will prevent the wanton destruction of valuable natural capital assets that has occurred in so many parts of the world and protect the country's precious ecological resources for present and future generations and for the benefit of the many species with which we share the planet. They will direct policy attention where it matters and

ensure genuine, effective, and integrated GNH-based development for the country and as an example for the world.

Fortunately, significant improvements in data availability and assessment methodologies in recent years now enable — for the first time historically — movement towards a better, more accurate, and more comprehensive accounting system that properly reflects the nation's true wealth. Good forest inventories clearly showing age and species class variations, for example, now allow thorough analyses of forest cover, quality, and health that were not previously possible. Thus, government departments will be able to feel confident in using the new National Accounts data to ensure that previously hidden social, human, environmental, and cultural values are duly and properly considered in assessing assets, liabilities, and the true benefits and costs of diverse economic activities. They can thereby ensure that vital aspects of our inherent wealth are not assigned an arbitrary value of zero, as they are in our conventional accounting mechanisms, and that any depletion or degradation of that wealth can be quickly recognised and reversed rather than remain invisible as at present.

Because they speak the language of measurement, accounting, and valuation, the new National Accounts can also be used as strategic tools to communicate with the world of conventional economics, even while acknowledging fully that profound human, social, and environmental values can never properly be reduced to monetary terms.

## 1.3 Summary of potential policy uses of the new National Accounts

A capital approach to development values natural capital, human capital, social capital, and cultural capital, in addition to built and financial capital. In fact, by adopting the capital model, the Royal Government of Bhutan will be making a far-reaching commitment that will eventually produce a new form of budget estimates and economic accounting procedures. That, in turn, will affect policy priorities, the current system of financial incentives and penalties (including taxes), the prices that consumers pay for products, and, therefore, consumer behaviour.

To give just one illustrative example, a new accounting system that explicitly values natural capital can produce a system of financial incentives and penalties that will, in turn, price local, organic, and sustainably grown produce — that sustains soil value and minimizes greenhouse gas emissions — lower than imported, chemically grown, and unsustainably produced agricultural products that deplete soil quality and increase transport-related emissions.

This is in sharp contrast to the GDP-based accounting system that ignores natural capital values and environmental benefits and costs, labelling them "externalities," and thus generates economic incentives to import, sell, and buy unsustainably grown produce from India and elsewhere. When other social and economic "externalities" like food safety, farm labour conditions, local jobs, and upstream and downstream 'spinoffs' are added to the equation, the new accounting system clearly leads to policies that will price local, sustainably grown produce so that it is within the reach of consumers.

The following examples of potential policy uses of the new National Accounts are arranged in a somewhat "chronological" order. Thus, the first three policy applications below are short-term in the sense that they can be implemented without delay and require only baseline data. The second three are medium-term applications that require the development and use of trend lines. The final two are medium- to longer-term systemic and structural shifts that can be expected to occur as a result of adoption and implementation of the new National Accounts.

### *1. Clarify and help set goals and targets*

Because both the GNH Index and the new National Account measures reflect consensus GNH values, and embody a vision of where we want to be 5, 10, 20, and 50 years from now, they can clarify and help set specific goals and targets that mobilize the population behind that common vision. Any measure of progress is normative by nature — always value-based and assessing progress towards an agreed vision and set of goals. The consequent target setting is not theoretical or conceptual but very practical.

For example, if we know what the crime rate, poverty rate, or waste disposal rate is, as well as the costs of these to the socio-economic environment, we can set concrete targets of reducing those rates, for example by 20% by a certain year, and we can measure our progress in getting there. In this way, we can practically assess the degree to which we are on track, in these cases, in achieving our agreed goals of a safer, healthier, more sustainable, and more economically secure Bhutan.

### *2. Provide good evidence that is necessary for informed decision-making*

The wealth of data already being collected in Bhutan provides the nation with detailed, integrated information on its social, economic, and environmental wellbeing and progress. The GNH Index, the Bhutan Living Standards Survey (BLSS), and other national surveys and data sources will provide the evidence base for the new National Accounts and for making good policy decisions that seek to integrate and harmonize social, economic, and environmental objectives with a view to enhancing wellbeing in the largest sense — for both the present and future generations. An example of the integration of such evidence is the recent use of the CBS GNH survey time use data to produce the first ever economic valuation of voluntary work in Bhutan for the new National Accounts.

Without reliable, comprehensive evidence and measures to track progress, policy making will inevitably be blind and visionless at best, and misguided and even dangerous at worst. It will have no understanding of where the greatest needs are, and which population groups need to be targeted with which programs. By contrast, evidence gained through the GNH Index, other data sources, and the new National Accounts will potentially greatly enhance the capacity for informed policy making.

### *3. Demonstrate linkages among the GNH domains*

In providing data for the new National Accounts, the GNH Index measures — spanning social, economic, and environmental components of happiness and wellbeing in nine

different domains — enable policy makers and the general public to be aware of the practical trade-offs involved in each decision. If we make progress in one area, is it at the expense of another, or can we identify actions that will advance all GNH domains — psychological wellbeing, time use, community vitality, culture, health, education, environmental diversity, living standard, and governance — simultaneously and harmoniously?

Understanding the direct relationships between the GNH domains and components is vital for policy formulation, as effective policy must necessarily target those sectors most responsible for actual impacts. For instance, the relationship between income, consumption, and environmental impact is important to recognise, because examining human demands on the natural world cuts through the illusion that we can improve the living standards of the poor without also questioning the consumption patterns of the rich, and it underscores the ecological reality that we cannot maintain current excesses if we also intend to alleviate hunger and poverty.

### *4. Provide early warning signals and predictive power that can trigger preventive remedial action*

The analytical strength of examining social, economic, and environmental realities in an integrated way, and from a net accounting system that recognises the costs as well as benefits of economic activity can provide policy makers with early warning signals of potential difficulties and challenges. This predictive capacity can enable them to take timely remedial action well before any crisis develops. A few illustrative examples will demonstrate this particular policy function.

As the Canadian example above indicates, assessing the economic value of civic and voluntary work can point to certain trends that might threaten the viability of the voluntary sector. Numbers that reveal a massive decline in voluntary work should therefore provide an early warning signal that more interest and investment should be focused on the voluntary work sector of society.

As another example, a comprehensive analysis of economic viability in the agriculture sector such as the new National Accounts could provide based on five key indicators — net farm income, expense to income ratio, debt to income ratio, return on investment, and solvency ratio — would reveal how economically healthy that sector is. If those five indicators were in decline, as was found in a GPI Atlantic study in Nova Scotia, this would point to an overall decline in the economic viability of farming. Such a study could warn that if existing trends continued unabated, farmers could be forced off the land simply because they could no longer afford to farm. If early warning signals show that it is costing farmers more to farm than they are earning, preventive remedial action to enhance farm economic viability, such as targeted investments in areas under threat, might be called for.

The ability to provide early warning signals is reflected in the entire approach of the new National Accounts to natural resource accounting. In Nova Scotia, GDP measures showed the fishing industry "booming" in the 1980s and early 1990s, and fishery GDP in Nova Scotia never looked better than on the verge of the collapse of the Atlantic groundfish stocks, simply because it only counted what was extracted from the oceans and failed to account for what was left behind — which was very little. As noted earlier, GDP is a *gross*

rather than *net* accounting approach that only counts what we extract from our natural resource base and takes no account of the health of the resource — in this case the fish stocks in the oceans — left behind. Reliance on GDP statistics actually encouraged over-fishing and natural resource depletion simply because it tracked only the numerator (fish landings) and not the denominator (fish stocks). Such primitive and poor accounting practice does not serve the populace or its rich natural inheritance. Bhutan's new National Accounts will overcome such weaknesses and flaws in conventional accounting mechanisms by accounting properly for natural capital values and trends.

But what is most important in the example above is the fact that conventional GDP-based measures sent no warning signals of the impending resource collapse, and in fact sent perverse and entirely misleading signals to policy makers, based solely on resource extraction data, that the industry was healthy. Similarly, in the agriculture example above, even if all five *net* farm viability indicators are trending seriously downward over a long period, *gross* farm cash receipts (which are the primary input to agriculture GDP) can show upward trends that show no problem at all. Again, GDP-based statistics are incapable of sending early warning signals that in turn could trigger timely remedial action.

A basic *net* accounting system, as will be provided by the new National Accounts, is entirely in line with simple household budgeting practice, in which we count not only our gross income, but rather keep track of our expenses and debt *in relation to* our income and assets. Any *net* approach will have the predictive power described here and the capacity to send early warning signals that allow timely remedial action. That, in a nutshell, is one of the key purposes and practical functions of Bhutan's new National Accounts.

One final example of the predictive power of the new accounts is the ability to see unsustainable trends in the economy. For example, in Canada, the rate of debt growth during the so called economic boom period during the decade preceding the 2008 financial collapse, had massively outpaced the rate of income growth for 80% of Canadian households, thus threatening the ability of many households to manage and service their debt. Only among the wealthiest 20% of Canadians did the rate of income growth exceed the rate of debt growth — far too narrow a base for a healthy economy. More than 77,000 Atlantic Canadian households had become so deeply indebted during the 'boom' period that they could not get out of debt even if they sold everything they owned, including their homes. Thus, the recent economic crash was not a surprise to those who had been using full-cost accounting measurements and who were therefore able to predict future debt-serving problems.

### *5. Hold government accountable using objective standards*

The GNH Index and the new National Accounts will enable the Bhutanese populace to hold government accountable according to the agreed GNH standards of good governance. At election time, for example, Bhutanese people can assess the degree to which their elected representatives made progress towards the goals and targets established through the GNH indicators and accounts, and they can cast their votes accordingly. They can also assess their own personal commitment and that of their communities in making progress towards those goals. In fact, the new measures can ensure that — whichever political party gains power — all elected representatives are held to a set of common principles and consensus goals, and

they will all be judged by the same standard.

### *6. Act as a unifying force*

New measurement tools that establish commonly agreed goals and targets towards a shared vision can be a remarkable unifying force with the power to transcend partisan politics. Good measures of progress themselves contribute greatly to this unifying role, since they necessarily reflect deeply held underlying values and express agreed goals. In Bhutan, all of the GNH indicators reflect consensus values.

Of course, this unifying function does not eliminate the need for debate. While consensus goals, shared vision, and non-partisan measurement can help unify a society and provide a strong basis for evidence-based decision making and informed debate, politics is about *how* to achieve these goals and targets. Indeed, the appropriate role of democratic politics is to debate the best way to achieve the goals expressed in the GNH indicators and new National Accounts, even while there is a consensus on what those goals are and on the agreed ways of measuring progress towards those goals. To take two practical examples, there can be complete consensus on the need to reduce poverty and greenhouse gas emissions and even agreement on specific targets, and at the same time vigorous debate on how best to achieve those goals. In other words, there should be consensus on goals — the realm of measurement — and debate on strategy — the realm of politics.

### *7. Reverse destructive trends and crises created by the old paradigm*

Valuing natural, human, cultural, and social capital constitutes a new way of doing business, according to new criteria, and leading to new policies that advance economic, social, cultural, and environmental priorities simultaneously. Genuine courage and political will are needed to let go of the old paradigm and to adopt a new one. For example, we cannot justifiably use the language of sustainability without simultaneously challenging a materialist philosophy based on ever expanding consumption. This does not undermine the goal of "sustainable prosperity," so long as the term 'prosperity' is not mindlessly equated with expanded consumption. For example, an enhanced sense of prosperity may arise from expanded economic and financial security and from appreciation of our inherent natural, human, cultural, and social wealth, rather than from more material acquisition.

However, frank acknowledgment of a real paradigm shift means that using the new National Accounts is not simply adding a bunch of new indicators to existing ones that are fundamentally flawed and that currently send highly misleading signals to policy makers. If we do so, we run the danger of exacerbating rather than ameliorating confusion, however well-intentioned we may be.

For example, the new National Accounts do not use the GDP (or GDP per capita) as an indicator of national wellbeing, primarily because some GDP components signify a decline rather than gain in wellbeing, and because a quantitative measure of growth does not in and of itself signify an improvement in *quality* of life. However, the new National Accounts can directly measure some of the *outcomes* that may or may not be achieved by expanded GDP — such as employment, job security, economic security, financial security, and poverty

reduction. The phenomenon of capital intensive "jobless" growth — when economic output or growth happens with no increase in jobs — indicates that growth of GDP may not always achieve desired outcomes, and that other means may achieve those outcomes. Similarly, GDP growth has also often been associated with reduced real incomes for substantial portions of the populace, a growing gap between rich and poor, and the natural resource depletion and waste production generally associated with excess consumption. In short, robust and valid indicators of wellbeing must assess desired outcomes, and cannot include an indicator frequently associated with adverse outcomes.

In sum, the old and new paradigms are not reconcilable because they are based on different visions, goals, and assumptions, with the new National Accounts actually signifying a profound shift to a new sustainable development model.

This is stated explicitly here so that there are no illusions, and in order to quash the tendency to view the new National Accounts as social and environmental "add-ons" to the existing economic growth-based measures currently in use. Thus, the new National Accounts system begins from a critique of the flaws in the existing growth-based paradigm and accounting system, and every component of the new Accounts also constitutes such a critique. For example, implicit in an economic valuation of voluntary work is the critique that GDP-based measures ignore the value of productive unpaid work; and implicit in a forest valuation is the critique that GDP-based measures count excess logging and resource degradation as economic gain.

### *8. Steps towards implementing full-cost accounting in policy-making*

As a full-cost accounting mechanism, the new National Accounts can eventually change the structure of market prices so that they reflect and reward sustainable and socially responsible production or create punitive measures against unsustainable activities. Because price signals can be very effective in shifting consumer behaviour at the mass level, the new accounting system must be seen as the first step in a process that will eventually impact market prices.

There are four specific stages or steps in the implementation of full-cost accounting, which are briefly outlined below:

#### a. Build a new accounting system that incorporates benefits and costs of natural, human, social, and cultural capital

The first step is the incorporation of social and environmental benefits and costs into the central accounting system and core measures of progress. The new National Accounts will begin to build the new accounting system by valuing natural, social, cultural, and human capital properly. Much more work is needed in this field, including improvements in data sources and methodologies. But tremendous strides have been made globally in the last three decades in both data collection and measurement methods, so that it is now possible to identify, and in many cases to quantify, the true value of natural, economic, social, and cultural assets, and the full benefits and costs of economic activity. Thus, what was once just a concept and an aspiration is now feasible and measurable, and there is no barrier for a jurisdiction like Bhutan to construct, adopt, and implement the new indicator and accounting tools as guides to policy.

**b. Foster political will to adopt and implement the new accounting system**

There are many leaders, countries, and international organisations that pay lip service to the new wellbeing and sustainability measures, and that accept the principles of full-cost accounting in theory and concept. After all, the logic and evidence are indisputable. But real political will is required to adopt and implement the new measures and accounting system in practice, to demonstrate its practical feasibility, and to use it actively as the nation's core measures of wellbeing and valuation and as the evidence base for new policy.

The Kingdom of Bhutan is ideally suited to take that leap, and to tread fully and wholeheartedly where few have yet dared. Through its GNH development approach and policies, GNH Index, and other GNH value-based initiatives, Bhutan has already long indicated its willingness to be on the forefront of the new integrated development path. The Prime Minister has also made the explicit commitment to move to an expanded capital system of valuation — which places Bhutan well ahead of other nations in this field.

**c. Create a system of financial incentives and penalties (e.g. tax shifting and governmental investment shifting)**

Once the new accounting system has been adopted by government, it provides the basis for a system of financial incentives and penalties designed to encourage sustainable and socially beneficial behaviours that contribute to wellbeing and to discourage unsustainable behaviours that undermine wellbeing. Thus, new taxation systems would tax the negatives (actions that create harm) and not tax the positives (that create social benefits). This system of financial incentives and penalties might include very practical actions like shifting taxes from positives such as taxing income derived from labour, savings, or investments to negatives such as taxing high-carbon intensive consumption products, pollution, or natural capital depletion. An example is the gradual shift, in some European countries like Denmark, from payroll taxes (which may dampen useful economic activity) to pollution, carbon and other "green" taxes, which penalize activity that produces long-term costs.

It is important to note that tax shifting — also known as Ecological Tax Reform (ETR) — without compensating income tax reform could potentially place the burden of increased prices for some goods and services (like gas and heating fuel) disproportionately on lower income brackets. Proponents of tax shifting therefore recognize that this potentially regressive outcome would have to be counteracted through progressive income tax reductions. Successful tax shifting policies, with compensating income tax reductions, should not disproportionately increase the tax burden on any segment of society. As well, a key principle of such taxation shifts is that they must never become "tax grabs" by government, but, on the contrary, remain revenue neutral in aggregate, creating no overall increased net burden on citizens.

Taxation penalties and increased fees on unsustainable or harmful activities like gas-guzzling SUVs and soil-degrading synthetic fertilizers would be accompanied by financial incentives that provide rewards for natural and social asset protection, and that subsidize renewable energy development, public transit, local organic farming, and uneven-aged forest

management. For example, Costa Rica has implemented a system of Payment for Ecosystem Services (PES) to reward sustainable land and resource stewardship by farmers and others. The underlying ***full-cost accounts*** provide an objective basis for determining the ngultrum amounts of such incentives and penalties, since the accounts assess the true and actual benefits and costs of economic activity to society.

Shifting governmental investment has profound implications and far-reaching societal effects that can influence behaviour more effectively than almost any other government action. That is because subsidizing actions that create benefit and penalizing activities that cause harm — which is surely the primary function of taxpayer-funded incentives and penalties — must affect market prices. Thus, if ecological stewardship is rewarded, then sustainably produced food and goods should be cheaper (to reflect the subsidies) than those that poison the soil, water, and atmosphere through use of chemical toxins. And, as noted, abundant evidence indicates that nothing changes behaviour like price signals. In some jurisdictions, increases in fuel prices and cigarette taxes did more to get SUVs off the road and lower smoking rates than all the environmental and health arguments combined.

What this means is that expanding the National Accounts to include valuations of natural and social capital is the initial sharp cutting edge of a new sustainability-based economic paradigm that will produce far-reaching societal change. In other words, shifting investment to protection, conservation, prevention, and restoration actions whose benefits are greater than the costs of inaction takes the accounting exercise into the realm of politics by translating the natural capital and ecosystem service valuations into a set of incentives and penalties that in turn affect prices, which then influence societal preferences. But it is the accounting mechanism that is the basis of the major societal shift we need to see, because that is what establishes the value of the ecosystem services, which in turn determines the levels of investment required to protect those services.

Internationally, current investment — both by governments and business — is almost entirely in manufactured or built capital, which in turn grows GDP. Since this is how 'progress' is currently measured, it is not surprising that investments in natural, human, and social capital have seriously lagged and been neglected, since those capitals are invisible and uncounted in our conventional measures of progress. And so in some nations, we have huge anomalies like perverse subsidies to nuclear power and fossil fuel industries, which make GDP and the economy grow, while the environmental costs of those investments are ignored.

A new study, released on 19 January, 2012, for the first time assesses the global dollar value of such perverse current subsidies. According to Lester Brown, the study author:

> We distort reality when we omit the health and environmental costs associated with burning fossil fuels from their prices. When governments actually subsidize their use, they take the distortion even further. Worldwide, direct fossil fuel subsidies added up to roughly $500 billion in 2010. Of this, supports on the production side totaled some $100 billion. Supports for consumption exceeded $400 billion, with $193 billion for oil, $91 billion for natural gas, $3 billion for coal, and $122 billion spent subsidizing the use of

fossil fuel-generated electricity. All together, governments are shelling out nearly $1.4 billion per day to further destabilize the earth's climate.[18]

It is that kind of perverse investment that also resulted in building the Chernobyl and Fukushima nuclear plants that have created environmental catastrophes for which the public then bears the costs. The ever more grotesque effects of such perverse subsidies illustrate the importance of shifting investment to conservation, protection, and restoration of vital ecosystem services. So long as natural capital values and environmental impacts and costs are ignored in the National Accounts, those kind of perverse subsidies will continue, while insufficient and inadequate investments in nature's services will continue to result in the depletion and degradation of our precious natural wealth and heritage at severe long-term cost to humanity and other species.

Thus, the ultimate practical purpose of proper natural capital and ecosystem service accounting is precisely to shift at least a portion of investment to the conservation and restoration of natural capital. In our existing, conventional GDP-based National Accounts and measures of progress, there is no present incentive for that kind of natural capital investment. So the practical policy purpose of the new comprehensive National Accounts that include the value of natural, human, and social capital is to shift investments to sorely neglected areas that are essential to human survival and wellbeing on the planet. In short, this natural capital valuation process, demonstrating where the most cost-effective natural capital investments can be made, is actually very "good news," because it shows that we do have the power and capacity to reverse the increasingly dangerous degradation and depletion of nature that have characterized our GDP and growth-driven economic paradigm of recent generations.

To administer such ecosystem investments, payments for ecosystem services (discussed in section 4.4 below), and other systems designed to protect nature's services, new funding mechanisms are needed that must meet the criteria of being required, sufficient, fair, and efficient. The mechanisms shown to work best globally are built around the three key categories of human society directly affecting and affected by ecosystem services — the providers or stewards of these services, the beneficiaries, and the damagers or polluters:

- The first of these categories — the providers — are compensated for their work and investment in caring for and protecting nature's services.

- The beneficiaries often fund that compensation to providers, at least partially, by paying certain charges that reflect the direct and indirect benefits they reap from the investment in nature. A typical example used in many jurisdictions is water charges levied on consumers to reflect the costs of watershed protection.

- The third category — the damagers or polluters — are penalized for the damage they cause — the so-called "polluter pay" principle. In conventional practice, such penalties mean that producers of toxic products or of goods manufactured in environmentally damaging ways build in such pollution and damage charges into the price of the goods they produce. That effectively passes on the costs of pollution and environmental damage to the consumers of ecologically harmful goods — making

those goods more expensive — and thereby encourages businesses to produce goods in more environmentally benign ways so that they can maintain their competitive edge in the market.

While these funding mechanisms use market instruments, experience shows that a proactive government role is crucial for the new ecosystem-friendly funding mechanisms to work. That is because markets alone do not work with public goods, and will therefore not intrinsically adjust to protect the "commons" — including the atmosphere, water sources, soils, wetlands, forests, biodiversity, and habitat for other species. Markets alone, therefore, cannot protect those resources effectively or in the long term, and will likely deplete and degrade that natural wealth whenever its protection conflicts with the short-term gains frequently sought in the private transactions that constitute market exchanges. Therefore, deliberate government intervention and action to protect the commons is required to initiate and set in motion ecologically friendly market responses.

In the "polluter pay" example cited above, therefore, government penalties on pollution are the essential trigger to which market mechanisms then respond by blunting the competitive edge of polluting firms. Strategies involving fees, taxes, and investment systems can only be initiated by government. Once that happens, however, the market will respond to those incentives and penalties.

**d. Encourage pricing to reflect true costs and benefits**

The final step in implementation of full-cost accounting systems, which should follow quickly from the third step, is the reflection of social and environmental benefits and costs in the actual market price structure, so that the consumer actually pays the true cost of the products purchased. In the above analysis, a change in the tax structure as suggested would reduce the market price of sustainably produced local goods and increase the price of unsustainably produced and transported goods. These steps would not only increase market efficiency by encouraging producers to reduce energy and other costs, but would also decrease the burden on taxpayers and the need for external regulation of the market.

The incentives and penalties described above naturally affect consumer prices, and thereby have the potential to change behaviour. It is absurd, for example, that organically grown local food is currently more expensive than chemically grown food imported from thousands of miles away — a perversity only made possible by ignoring the true costs of soil degradation, transportation, greenhouse gas and pollutant emissions, and other actual costs of production and transportation, and also by ignoring the true value of enhanced nutrition, freshness, health, and resource conservation.

Once goods are properly and accurately priced according to their true costs of production and distribution, not only will consumer behaviour change, but the market economy itself will become far more efficient — with profligate and wasteful energy use penalized for example, and rewards for energy conservation built into the price structure. This enhanced market efficiency will in turn reduce the need for heavy-handed government regulation and intervention. Building pollution costs into market prices, for example, provides a natural

incentive for producers to minimize pollution in production processes, and thus reduces the need for taxpayer-funded cleanup costs after the fact.

There is no more effective trigger for change than price signals. Implementation of this final pricing step in the full cost accounting system — flowing as it does naturally from adoption of the new accounting system itself — will therefore provide a most effective and powerful incentive for beneficial and far-reaching social change that truly enhances wellbeing and sustainability.

Nowhere in the world do market prices currently reflect full social and environmental benefits and costs. It would be a remarkable economic revolution if Bhutan became the first country in the world to make this happen — especially in a world where perverse subsidies are currently the norm. Full-cost accounting is therefore quite literally a way to ensure that all aspects of the economy, including the prices of consumer goods and services, reflect a society's larger social and environmental values and goals. And in Bhutan particularly, full-cost accounts are essential for full realization of GNH.

- What are indicators?
- What are accounts?
- Why we need both

## 2. Indicators and accounts

*Indicators and accounts are powerful. What we count and measure reflects our values as a society and determines what makes it onto the policy agendas of governments. They can tell us whether we are better off than we used to be, whether we are leaving the world a better place for our children, and what we need to sustain or change.*

In the last half century, as we have seen, the economic idea that has dominated the public, policy, expert, and journalistic discourse is the equation of economic growth with societal health and wellbeing. The idea that economic growth is good no matter what is growing — even debt, disease, environmental degradation, social unrest — has dominated economic thinking and informed policy in the industrialized world since the Second World War. At the same time, growing global dissatisfaction with this delusional paradigm has led, in the last two decades, to significant advances in the development both of indicators that measure real progress towards a wide range of important social, economic, and environmental objectives and of accounts that include valuations of natural, human, and social capital. This burgeoning understanding of the interdependence of social, economic, and environmental factors in development and of the interrelated nature of reality represents a very different idea that challenges the materialist assumption implicit in the growth-based view of wellbeing.

The new paradigm is actually reflected and applied in two sets of measures, both of which are equally necessary and which complement each other—indicators that assess progress, and accounts that assess value.

### 2.1 What are indicators?

There is an old saying that the finger pointing to the moon is not the moon. Likewise, indicators can only point to a social reality, but can never describe it fully and accurately. Indicators are statistics that assess progress over time and that can therefore potentially be used to measure trends in collective wellbeing. They are based on physical measures (e.g. employment, crime, poverty, and illness rates, levels of educational attainment, greenhouse gas and air pollutant emissions, etc.). The units of measurement are unique to each indicator,

with rates often expressed in per capita terms (e.g. number of jobs, crime incidents, smokers, or graduates per 100,000 population or as a percentage of total population, or tonnes per capita for pollutant emissions).

Good indicators provide essential information about the health and functioning of a system and can tell us whether progress is being made. They can also perform vitally important policy functions, sending early warning signals to policy makers, and assessing which programs are working and which are not in attaining agreed upon targets.

However, not all statistics are created equal. For a statistic to be an indicator it must meet certain standards and satisfy certain substantive and technical criteria. For instance, an indicator should provide a clear and accepted benchmark for measuring progress; and provide information about a feature of the system that has been shown to be linked with a desired outcome, or about a current or future problem in the system. Indicators should also be readily understood; they should be feasible in terms of time, cost, and expertise required to collect and analyse the data; and they should be generally accepted as valid and reliable at measuring what they are intended to measure.

According to these criteria, many existing 'indicators' are inadequate to measure progress in a particular field, and new indicators therefore need to be developed that in turn will require new data collection. Education indicators are a case in point. First, 'schooling' has been implicitly equated with 'education', with almost all education indicators narrowly related with formal schooling, despite evidence that most learning occurs in other settings.

Among those purported education indicators, graduation rates are generally accepted as a mark of 'educational attainment,' and school 'drop-out' rates as a mark of system failure. However, abundant evidence now reveals that graduation rates are often a better marker of the job market than of educational attainment, with students, especially in the west, dropping out in response to lucrative employment opportunities and staying in school in the absence of such opportunities. As well, higher graduation rates are unrelated to the content and quality of instruction and learning, have resulted in no measurable improvement in literacy levels, and have not been correlated with changes in societal knowledge in fields like civics, culture, science, ecology, indigenous knowledge, media literacy, and many others. In short, this is a case where a widely used 'indicator' does not necessarily measure what it is intended to measure.

As well, in the last twenty years there has been a global surge in education indicators related to economic policy objectives — in particular to assess whether formal education is contributing adequately to economic productivity and competitiveness in the global economy. But this information also does not tell us whether people are becoming more educated, knowledgeable, or wise. In fact, it may well signify nearly the opposite.

The increased focus on the role of education in serving the economy has often marginalized and come at the expense of broader considerations, such as the role of education in advancing social justice and environmental sustainability, of spreading civic values, and of transmitting cultural values. And the focus on education in the service of economic productivity and competitiveness may even be anti-educational to the degree that it unquestioningly accepts the economic status quo, fails to expose serious flaws in the

economic system, and fails to explore whether that system effectively serve the needs of society.

In addition, most conventional education indicator systems are based on what has been labelled an 'industrial' model of education that is sometimes called the 'productivity model.' This model encourages the view that the educational system produces "products" (graduates) by taking various raw materials, i.e. students, and processing them in schools. Many education indicators that currently exist were also chosen simply because the data were readily available rather than to assess whether a society is actually becoming more educated, informed, knowledgeable, and wise.

In other words, if a set of indicators focuses attention on the wrong issues, or purports to measure something it simply does not, such indicators may create more confusion than clarity, and more problems than they solve. The education example is presented here simply to acknowledge that some of the key criteria for good indicators noted above may not be adhered to in cases where the assumptions underlying accepted conventional measures are conceptually flawed.

In response to such flaws and challenges, a developmental process to improve and expand existing indicators has occurred in the last quarter century in a wide range of new areas — first identifying key new indicators; then developing definitions, standards and thresholds to allow for comparability; then collecting data in new survey instruments and questions; reporting trends over time; and then refining and improving data collection and measurement methodologies.

The emerging indicators and the new evidence that has become available through their development are an essential first step in bringing vital new issues onto the policy agenda, and in directing policy attention to a wide range of pressing social, health, and environmental concerns. As well, globally, the new indicators have played a key role in 'objectifying' and bringing into the mainstream issues like poverty, income distribution, and greenhouse gas and pollutant emissions, which were once confined to the domain of advocacy or dismissed as marginal concerns of particular interest groups.

In general, indicators are expected to fulfill a myriad of functions from reporting on the status or health of a system, to monitoring changes, explaining the causes of prevailing conditions, presenting the strengths and weaknesses of a system, and predicting future changes. To this end, there has — particularly in the last 20 years — been unprecedented development in the data sources required for such measurement, vast improvements in measurement methodologies, and construction and administration of new survey instruments designed to collect the appropriate data in areas never previously monitored or tracked.

In Bhutan, reliable and comparable time series data are now becoming available that, for the first time, will allow measures of progress over time in a wide range of social and environmental dimensions. The Centre for Bhutan Studies has developed the GNH Index, which consists of 72 indicators in 9 domains. Initial baseline data were tested and collected in 2007 and 2010 to populate the indicators, with the intention that these data will be updated every two years.

In order for these new wellbeing indicators to be effectively and enduringly integrated into the policy arena to provide a sound evidence base for achieving social, economic, and environmental objectives in policy and planning scenarios, a second key measurement step is essential — the development of a set of new National Accounts.

In the previous chapter, the policy uses of indicators and accounts were summarized, and the relationship between measurement and policy was explored. It was seen that the new indicators and new National Accounts can be very practical policy-relevant tools that shape the policy agenda by providing good evidence for informed decision-making, help set goals and targets, clarify trade-offs, evaluate programs, hold governments accountable, and spur an integrated, holistic development path.

## 2.2 What are accounts?

While indicators assess *progress* over time using different units of measurement, accounts assess *value*, with units of measurement expressed in common monetary terms (ngultrums) to the degree possible, and with evidence describing and pointing to economic value when monetization is not possible. Accounts form the basis of government financial incentives and penalties — including taxes, subsidies, and investments in particular sectors of the economy. And those financial incentives and penalties in turn affect price — which is one of the most immediate, powerful, and effective determinants of behavioural change.

Accounts depend on the data and evidence provided by indicators. They calculate economic costs or benefits based on evidence provided by the indicator (e.g. rates of crime, volunteer work, pollutant emissions, etc.), and the savings (in ngultrum) that will accrue from an improvement in the indicator. For example, a decline in crime rates should result in savings from avoided victim losses and hospital costs and avoided expenditures on prisons, police, and court costs, reduced pollution will avoid health and clean-up costs, while higher rates of voluntary work mean that citizens are voluntarily providing services that would otherwise cost government money.

Policy makers need both kinds of measures — indicators and accounts — in order to build a system of economic valuation onto the measures of wellbeing for the purposes of forging economic policy, including systems of taxation and tariffs, and other forms of financial incentives, subsidies, and penalties that can be implemented in order to encourage desired changes in the indicators.
Below are several examples of the difference between indicators and accounts:

- Crime rates (an indicator) tell us — in criminal incidents per 100,000 population — whether crime is going up or down, with lower rates signifying progress. Accounts tell us the cost of crime to society — how much we spend in dollars on courts, prisons, burglar alarms, security guards, hospital costs due to assault, replacing victim losses, etc. This can be expressed as the amount we would potentially save and have available for more productive investments in wellbeing if there were no crime.

- Trends in volunteer work can be a good indicator of the strength of 'civil society' — and of generosity and community strength and vitality — and tell us, in hours, whether volunteerism is increasing or declining. Accounts tell us the economic value of volunteer work by assessing what it would cost to replace for pay the services presently provided for free by volunteers. If volunteerism declines, accounts tell us the lost economic value of those missing volunteer hours.

- Unemployment rates (an indicator) tell us — in number of unemployed as a percentage of the total labour force — whether we are making progress in reducing unemployment. Accounts tell us the cost of unemployment to society in terms of lost productivity, fiscal costs, physical and mental health costs, crime, and costs of family breakdown. If unemployment declines, accounts can then tell us the economic savings that result from fewer people being unemployed.

- A climate change indicator tells us — in $CO_2$ equivalent kilotonnes — whether greenhouse gas emissions are increasing or not, and therefore whether we are making progress in combating climate change. Accounts tell us the economic costs of climate change damages and the costs of controlling and reducing greenhouse gas emissions by a certain amount. By comparing those damage costs with those control costs, accounts enable us to assess the cost-effectiveness of particular measures to reduce emissions.

These examples are provided to clarify the relationship between indicators and accounts, and to show why the latter depend on the data and evidence provided by the former. It is the change in the rates of a particular indicator that allows for the calculation of the related economic costs or the savings that will accrue from an improvement in the indicator.

## 2.3 Why we need both

While indicators provide the physical measures on which a new accounting system will be based, they still do not challenge the accounting system that currently dominates our present economic paradigm.

Gross Domestic Product (GDP) is currently the primary measure used to "evaluate the health of the economy" — and, by extension, of society — despite the fact that it is a totally materialist measure that counts only goods and services exchanged for money. But GDP is not an indicator; it is an accounting system, despite the fact that it has been wrongly turned into an indicator of wellbeing and economic prosperity. Therefore, if the grip GDP currently has on decision-makers is to be weakened, it will not happen through the use of indicators alone. The current materialist accounting system needs to be reshaped to reflect the broader constituents of social wellbeing, including its social, cultural, and environmental components.

Consumer prices have been shown to be very effective in changing behaviour. In order to send price signals that are in accord with GNH values and principles such as ecological conservation and sustainability, cultural promotion, and community vitality, we need to

change the present produce-and-spend economic accounting systems to reflect the true social and environmental costs and benefits of economic activity. The new National Accounts system can shape an economic infrastructure aligned with GNH principles, which is capable of supporting future generations and of ensuring long-term sustainable prosperity in harmony with the natural world and with our deepest human and social values.

Indeed, the accounting component of national measurement systems has been shown to have far greater policy influence than indicators. This seems to be largely due to the reality that the policy arena is dominated by concerns over budgets, costs, and savings, and that expression of results in monetary terms reaches a much wider audience than expression in units specific to a particular indicator.

For example, the Nova Scotia Government created a new Department of Health Promotion with its own budget and minister (separate from the Health Department) in direct response to GPI evidence that the province of 940,000 people could save half a billion dollars a year in health care costs through avoided preventable illness. As well, municipalities across Canada made extensive use of the GPI Solid Waste Resource Accounts to change their waste management systems, based on full-cost accounting evidence that Nova Scotia's leading-edge solid waste management system saves at least $31 million a year — or $33 for every Nova Scotian — compared to the old landfill system.

In sum, the accounting component of measurement systems generally has more policy impact, and demonstrates greater transformative potential, than the indicators on which it is based. This may well be a function of the materialist ethos of the times, and it may well be more desirable to assess value in direct physical rather than derived monetary terms. But so long as budgets dominate policy considerations and GDP holds sway as the dominant measure of wellbeing and prosperity, Bhutan's new National Accounts will likely be the most effective tool to bring consideration of social and environmental benefits and costs into the policy arena and onto the agenda of policy makers.

- Stocks and flows
- Notes on: complexity, precision, the precautionary principle, limits of monetization, and technical capacity in ecological accounting methodology
- Principles and methods of full-cost accounting

# 3. Fundamentals and methods of the new national accounting system

*Most of our valuable assets are not on the books. We need to reinvent economics.*

– Robert Costanza[19]

*The key to restructuring the global economy is to get the market to tell the ecological truth.*

– Lester Brown[20]

## 3.1 Stocks and flows

Bhutan's present System of National Economic Accounts follows internationally accepted methodologies, standards, definitions, and concepts as defined by the United Nations System of National Accounting.[21] It provides information on various aspects of the economy, such as economic growth rates, GDP, exports, productivity, government debt, and sector performances (e.g. agriculture, manufacturing, mining, construction, retail trade, finance, etc.). At present, as in all national accounting systems around the globe, only a fraction of true wealth is recorded in these national accounts. Therefore, the standard accounts are remarkably narrow and distorted from the perspective of the country's actual wealth, and they are incapable of reporting on the full benefits and costs of economic activity.

Two types of accounts or systems of economic valuation are always needed — stock accounts and flow accounts. Stock accounts consist of national balance sheets that assess a nation's assets, liabilities, and wealth (which is defined as assets minus liabilities). These stocks — also sometimes called capital — consist of produced tangible assets, non-produced tangible assets, and financial assets and liabilities. Produced tangible assets include the value of the existing assets and the value of new investment. National stock accounts count primarily the value of produced capital like equipment, machinery, and buildings, financial

assets and liabilities, and certain very limited elements of natural capital, but they mostly ignore the value of human, social, and cultural capital. With the exception of timber, land, and subsoil assets like oil and minerals, they also exclude most components of natural capital and qualitative valuations like forest, water, or air quality.

Conventional balance sheets also fail to account for the depreciation or degradation of key components of capital, and thus are unable to send early warning signals that would point to a need for re-investment. For example, a sick and uneducated populace reflects a depreciation of human capital (a stock) that might require investment in health promotion and education, while higher crime rates reflect a depreciation of social capital. A forest that is clear-cut reflects a depreciation of natural capital, and thus points to the need for 'living off the interest' generated by forest capital through harvest methods like selection cutting that maintain rather than deplete and degrade the full range of forest functions and services.

As previously discussed, national stocks also include natural, human, social, and cultural capital, as well as produced and financial capital. Because the economy depends on the state of all of the capital stocks both now and into the future, it is important that the new National Accounts should be able to measure trends in the state of these capital stocks (whether they are appreciating or depreciating in value), including their overall state as well as their performance. It is also important for the new National Accounts to link the various types of capital stocks to ensure that one type of capital is not increasing at the expense of another (e.g. built capital at the expense of natural capital as is so often the case), and so that the capital stocks are working together in balance for the long-term sustainability of the economy.

In conventional accounts, flow accounts measure economic activity and capital and financial transactions on at least an annual frequency. A house, for example, is a stock or capital asset, while rent (actually paid or else imputed for homeowners) is a flow captured in consumer spending accounts. The income flow represents the rent less intermediate expenses, allowances for depreciation, and a real interest rate (i.e. the opportunity cost of making the investment).

All of the capital stocks also provide services, which can be captured in flow accounts. For example, natural capital consists of both natural resources or stocks (like forests) and ecosystem services (like carbon sequestration, soil formation, and watershed protection), which are the flow of benefits provided by the stocks. And a term like 'depreciation' applies to stocks that are either depleted in quantity or degraded in quality, while a decline in ecosystem service flows results in 'costs' to society by comparison with the value of 'benefits' provided by optimally functioning services.

GDP in Bhutan, as in all countries, is estimated using the production and expenditure approach.[22] Present flow accounts — input-output and income and expenditure accounts that give us GDP — count only the value of market production (goods and services produced for pay and sold in the market). The accounts take no account of the value of unpaid work or of the un-priced services to society provided by nature, culture, social networks, or knowledge — though these underpin the market economy itself. Ironically, when those un-priced services become depleted or degraded and have to be replaced for comparable paid services, we then count the value of these paid services in our economic

growth statistics, and thus tout their replacement value as a contribution to prosperity, even though they actually reflect a loss to society. And when economic activities like child care shift from the unpaid household sector to the market economy, we again mistakenly count that shift as "growth."

These examples clearly indicate a need to include values of unpaid work and un-priced non-market services as actual production in proper flow account estimates. As Arthur Pigou demonstrated as long ago as 1932, the absurdity of the present system is well illustrated by the fact that GDP goes up when someone hires a housekeeper and goes down when the employer marries the housekeeper.[23]

The United Nations as well as countries such as France, England, Canada, and New Zealand have recognized the limitations of the current national accounting systems, and are beginning to take concrete steps to overcome and remedy some of the inadequacies of the existing accounts. However, these steps mainly include development of 'satellite accounts' for various sectors, such as those dealing with the environment, tourism, volunteer work, and transportation. Thus, these satellite accounts are frequently sidelined and do not impact the structure of the central national accounts themselves. They do not therefore challenge the supremacy of the GDP-based measures that are still mistakenly used as indicators of wellbeing in policy planning processes.

These satellite accounts have other shortcomings as well. For example, in Canada, the natural resource stock accounts aim to measure and add to the national accounts "stocks of natural capital" including oil, natural gas, minerals, timber, and land, and to account for annual changes in these stocks due to natural processes and human activity. However, not all natural capital stocks are included — for example, not all forest, energy, and mineral resources are measured. And the only forests that are given any value are those that are accessible, commercially valuable, and slated for timber harvesting.[24]

Such 'timber accounts' fall far short of the value of Canada's natural forest capital and account for only a fraction of the goods and services provided by forest ecosystems, both directly and indirectly, to the economy. The value of forest services like climate regulation and carbon sequestration, watershed and soil protection, flood control, biodiversity, provision of habitat for other species and recreational opportunities, and more, remains invisible both in Canada's national accounts and in its satellite natural resource accounts. As a result, these forest values are not adequately considered in decision-making, and are generally subordinated to the one key forest value that is measured and tracked — namely timber. To partially remedy this shortcoming, forest accounts at least need to include measures like age and species diversity and carbon storage value that reflect these wider forest values and that account for forest quality as well as simple fibre quantity.

Current accounting systems have a term for everything that is excluded — they call these exclusions "externalities," which are either positive impacts (benefits) or negative impacts (costs) that result from the production or consumption of goods and services. Examples of external costs are global warming, which is an externality of nearly all economic activity in our fossil-fuel based economy; water pollution, which is an externality of a pulp and paper industry or of factory farming; crime, which is an externality of high rates of unemployment; lung cancer, which is an externality of smoking; loss of habitat for forest-dependent species

and loss of watershed protection and flood control, which are externalities of clear-cutting; etc.

According to GDP-based measures, depleting our natural resource stocks contributes to current economic gain, even though these apparent gains are at the expense of future prosperity. As noted earlier, this is exactly what happens when we cut down our forests but count only the timber sent to market without accounting for what we leave behind in the forests. As also noted, this is simply bad accounting and bad economics, as any factory owner knows if he were to sell off all his machinery and count it as profit without acknowledging the deleterious impact on future production capacity. Present gross accounting methods also foster bad financial management, as we now recognize after a debt-fuelled decade of spending in the U.S. led to a financial collapse triggered by incapacity to service the debt. As well, failure to invest in human and social capital will be detrimental to future production capacity.

In summary, the new National Accounts will draw data from indicators of progress to create a set of full-cost accounts that include valuations of all key forms of capital — natural, social, cultural, and human, as well as the manufactured stock accounts that are currently assessed — and the services they provide (corresponding flow accounts). Only such comprehensive accounts can properly assess the cost-effectiveness of alternative policy options, and balance the costs and benefits of particular actions against the costs of not taking action.

## 3.2 Notes on: complexity, precision, the precautionary principle, limits of monetization, and technical capacity in ecological accounting methodology

Before outlining the principles and basic methods of full-cost accounting that are needed to produce the new National Accounts, it is necessary to briefly address here a few key issues and questions that frequently arise at this point concerning complexity, precision, uncertainty, limits of monetization, and technical capacity.

### *A note on complexity*

The GDP is a simple, straightforward single number, critics note, whereas the full-cost accounting method, with its valuations of multiple capitals — many not amenable to monetization — seems extraordinarily complex by comparison, and thus correspondingly difficult to grasp and use.

However, the full-cost accounting methods and the new National Accounts are actually much more intuitive, logical, and easier to grasp and apply than the GDP precisely because they correspond to our living reality, experience, and common sense. We know that good health, safe communities, decent living standards, clean air and water, a healthy environment, knowledge, and strong social supports are essential to our wellbeing. And we can readily understand an honest appraisal of our strengths and weaknesses, even when there are apparently conflicting trends. By contrast, and as typified by the October 1995 Atlantic

Monthly headline *If GDP is Up, Why is America Down?,* most ordinary citizens are hard put to explain the relationship between GDP and their wellbeing.

Thus, we should never apologize for complexity in the full-cost accounting methods — reality is complex after all — nor become apologists for a misguided simple-mindedness that excludes large portions of reality. Would we rather fly in a plane with a single gauge (say altitude), or one with a complex battery of interrelated gauges showing multiple aeroplane functions and piloted by a pilot trained to scan and read all these gauges? Piloting the ship of state is no less complex than flying a plane, and we are unlikely to reach our destination as a society safely with a single gauge (GDP) that excludes a wide range of activities vital to our security and wellbeing. Let us rather take the basic training needed to read and understand the gauges we need to achieve our shared vision and goals as a society.

The real issue here is not simplicity vs. complexity. Rather it is that the greatest danger lies in ignoring and concealing vital dimensions of reality, which in turn allows human security and wellbeing to be eroded almost invisibly. By contrast, the primary function of the new National Accounts is to shine the spotlight on these hidden but vital dimensions of personal, community, social, economic, and environmental health and wellbeing. Once these realities are exposed and addressed honestly and straightforwardly, policy options and solutions naturally present themselves.

One other dimension of the simplicity vs. complexity issue must be addressed here. Whether the new National Accounts would be more attractive and easier to communicate if results were aggregated to a single index number, as is the GDP, is a question that needs to be addressed by the government. It is important to note here that the new National Accounts are described in this prospectus as 'integrating' results in the sense of demonstrating key linkages and relationships between the social, economic, and environmental dimensions of wellbeing and progress. However, this prospectus does not attempt to give methods for 'aggregating' results to a single summary number for several reasons.

Methodological challenges of aggregation are probably insuperable, at least for the present. Those challenges include, but are not limited to, differing units of measurement for different indicators, differing data availability and time series, the subjective nature of the weighting processes required for aggregation, the arbitrariness inherent in assigning all indicators equal value, and conceptual flaws in aggregating indicators as different as crime rates, forest age class, obesity rates, and greenhouse gas emissions. In sum, the broad assumptions underlying aggregation efforts frequently act to compromise the integrity of the results themselves.

Even more importantly, such aggregation is not helpful to policy makers who are less concerned to know whether an overall index is going up or down than to know *what* is going up or down and thus to identify particular strengths and weaknesses amenable to specific policy intervention. For example, it is more helpful to know that smoking rates are down while obesity and diabetes rates are up than to mask those different trends with an "average" health rating showing little overall change. In other words, a single number or overall average has limited policy utility. It is the particulars that are needed for policy purposes. While a lack of aggregation provides no mask for the complexity of the new National Accounts, we believe it actually enhances the clarity of results for policy purposes and ensures the integrity and transparency of results.

In sum — yes, the new National Accounts are complex in the sense of focussing attention on the interrelated social, economic, and environmental dimensions of reality rather than simple-mindedly and misleadingly regarding the market economy as a closed box isolated from social goals and from the natural world that generates resources and life-support services and that acts as a repository for our wastes. But this complexity elucidates and clarifies rather than confuses and obfuscates because it describes the actual reality of our lives. Columnist Silver Donald Cameron recently described the difference using a provocative metaphor:

> Electrical engineers use a measure called the "signal-to-noise ratio," which compares the level of a desired signal speech, for instance, to the level of background noise. If it's hard to make sense of the speech because of the static, the signal-to-noise ratio is poor. [Full-cost accounts] filter out the static, and makes sense of the conversation. The GDP simply measures economic noise.[25]

### *A note on precision*

As discussed further below, money is acknowledged as a poor tool with which to value non-market variables, so no claim to precision in full-cost accounting valuations can therefore be made. However, neither that lack of precision, nor the assumptions and complexities involved in full-cost ecological accounting methods, constitute reasons to dismiss the methods or not to apply them. Non-market transactions like volunteer work do have value and provide real services to society and the economy, and so-called 'externalities' like climate change and resource depletion carry very real costs to society and the economy. Assigning an arbitrary value of zero to such benefits and costs — as in conventional GDP-based accounting systems that value only market transactions — produces far greater inaccuracies and distortions than using the best available evidence and methods to assign at least approximate values to non-market factors.

Because of the uncertainties involved in non-market valuations, it is important in full-cost accounting:

- to make the assumptions underlying each valuation transparent,
- to provide a range of estimates based on different assumptions, and
- to always cite a highly conservative estimate in public releases.

For example, simply varying the discount rate in net present valuations of anticipated future costs like climate change will greatly affect results, as will the use of different climate change models.

To illustrate the challenges, complexities, and assumptions involved in pricing non-market factors — and also to illustrate how full-cost accounting results err on the conservative side — one concrete example of accounting for traffic congestion from a full-cost transportation study is provided here. Although congestion carries real costs to businesses, commuters, and the natural environment, these costs, along with many other so-called "externalities" of driving, are ignored in conventional transportation accounting mechanisms.

The example study of road passenger transportation costs included congestion as one of 19 costs examined.[26] However, the study only included a few elements of congestion that were relatively amenable to valuation — excess time spent in traffic jams and heavy traffic, excess petrol consumed at those times, and excess greenhouse gas emissions attributable to that additional gas consumption. Thus, necessary exclusions of key variables and of costs that are more difficult to quantify is a key factor rendering many so-called "full-cost" estimates conservative. They are in fact "partial cost" estimates that aspire to "full-cost" accounting as better data sources and methodologies are gradually developed.

Even within the parameters of the three congestion costs that were considered (time, petrol, and GHG emissions), there were several data availability and methodological limitations that inhibited a true "full-cost" assessment of congestion costs. In this case, the GPI estimate considered only recurrent congestion occurring during the morning and afternoon rush hours, and not congestion occurring at any other time of day or due to snow storms, road works, or any other special circumstances. As well, the estimate considered only congestion occurring on major arteries leading into and out of the capital city, and not on any side street. In addition, the definition of congestion in this case excluded any slowing of traffic to more than half the posted speed (e.g. to 27 km an hour in a 50 km an hour zone). Perhaps most significantly, the three cost components considered — excess time, petrol, and GHG emissions — excluded other congestion-related business losses (due to freight delays and employee tardiness for example), excess air pollutant emission costs, health and stress impacts, and other costs that were difficulty to quantify.

In sum, this one small example — of just one of 19 separate costs in one study — illustrates several key issues in full-cost accounting work:

- First, valuing non-market variables is complex and based on a range of assumptions that define and limit the scope of investigation.

- Second, despite the complexities and assumptions involved in accounting for social and environmental benefits and costs, such valuations are nonetheless essential in order to understand the true impacts of economic activity.

- Third, full-cost estimates are generally highly conservative, largely due to the necessary exclusion of key variables and cost components, and to citing low-end estimates in public releases whenever a range of estimates is considered.

- Fourth, despite the inherent lack of precision in valuing non-market factors, the resulting estimates are far more accurate, and a far more precise and comprehensive guide to policy and budget formation, than arbitrarily assigning these so-called externalities a value of zero, as in conventional GDP-based measures.

Due to continued refinement of data sources, ongoing efforts to improve measurement methodologies, and inclusion of additional factors in cost estimates as the new National Accounts are developed, the new National Accounts should always be seen as under continuous development and should always be open to improvements in data, methods, and comprehensiveness. In the beginning, some components will be far more advanced and

sophisticated in terms of data availability and methodology than others. For example, recent years have seen vast improvements globally in measures of population health and in cost of illness studies, while there is not yet even basic agreement on suitable indicators of an educated populace, let alone on quantifying the economic benefits of such knowledge.

Here we can only repeat that the frank acknowledgment of current limitations is no excuse for not embarking without delay on the absolutely necessary step of beginning to value natural, social, human, and cultural capital — for the simple reason that Bhutan, and the world at large, can no longer afford to see this capital depleted. "Out of sight" is simply no longer "out of mind," as the world belatedly begins to come to terms with the potentially catastrophic consequences of failing to account for real costs of economic activity like climate change, resource depletion, species extinction, stress, and cultural loss. To the extent that we make such costs visible in our accounting mechanisms and begin to measure progress holistically and comprehensively, we still have a small potential window of opportunity to reverse past losses, restore our innate heritage and wealth, and enhance the happiness and wellbeing of both this and future generations of Bhutanese and others.

### *A note on the precautionary principle*

Another caveat to be taken into consideration when developing policies informed by full-cost ecological accounting methods is the now internationally accepted "precautionary principle" which holds that lack of scientific certainty should not delay action to avert potentially irreversible damage. This principle is often explicitly written into environmental legislation. Thus, the Bhutan National Environment Protection Act (2007) states under the title "Precautionary Principle":

> Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.

In other words, when there is the risk of irreversible harm or damage, for example to an entire ecosystem and to vital life support services, we err on the side of caution rather than hoping that some technological innovation will bail us out in event of disaster. The recent Japanese nuclear power catastrophe and the massively destructive BP oil spill in the Gulf of Mexico are simply more recent examples of failure to apply the precautionary principle, and of unintelligent application of inappropriate technologies. By contrast, innovations in solar, wind, and other renewable energy sources point to intelligent use of appropriate technologies that have the potential to create real long-lasting benefit to humanity and the natural world. They point to the positive use of the precautionary principle in promoting investments that can guard against fossil fuel depletion and climate change.

This vital principle is relevant to a wide range of sustainable development indicators. For example, there is no absolute certainty that climate change and its potentially catastrophic impacts are caused solely by the greenhouse gas emissions that are one of the by-products of fossil fuel combustion. But the probability of a link is sufficiently strong in the eyes of the 2,000 scientists appointed by the United Nations to the Inter-governmental Panel on Climate Change (IPCC) that the international community has committed itself to significant reductions in greenhouse gas emissions.

The precautionary principle flows directly from the underlying principle of "sustainability" that is a core element of the unifying framework of GNH and the new National Accounts, and also the most essential pre-condition of wellbeing. The essential components of any definition of sustainable development are that we live in such a way that the next generation will not be worse off than we are and that we live within the capacity of the natural world to provide essential resources and to assimilate waste. From this perspective, the precautionary principle simply means viewing natural resource conservation, climate change, and waste production from the perspective of our children rather than ourselves. If we are uncertain of the potential impact of climate change on the world that our children will inhabit, then we will act now to reduce any possible future damage rather than put our children at risk.

The precautionary principle has long been standard operating procedure for the insurance industry, which assesses premiums in accord with potential likelihood of loss based on probability rather than causal certainty. For example, young male drivers may be assessed higher premiums, even though most will not have accidents. Just as good driving records will eventually lower premiums, it can be similarly argued that if the connection between greenhouse gas emissions and climate change is eventually disproved, fossil fuel reserves will still be available to be burned.

If, on the other hand, greenhouse gas emissions are at least partially responsible for the warming of the planet, as seems highly probable based on available evidence, then failure to act now could have catastrophic consequences for the planet and the next generation. Therefore the world community, including Bhutan, has recognised that simple prudence and responsibility to future generations demand immediate and concerted action. The adoption of the Kyoto Accord and subsequent climate change accords, most recently in Durban, is in accord with the precautionary principle.

Also in accord with the precautionary principle, scientists have recognised climate change as the most important environmental issue of the 21st century, with the UNDP calling it "the greatest challenge facing humanity." Therefore, in accord with the precautionary principle, any index of wellbeing and sustainable development will count all reductions in greenhouse gas emissions as an indicator of genuine progress and as a benefit that raises the overall index.

Also following the precautionary principle, it is incumbent on policy makers to create policies that reflect our uncertainty over valuation of ecosystem services in general. Thus, the prudent course of action for policy makers is to acknowledge that we do not know exactly how valuable these ecological life-support services might be, and to recognize that there are potential thresholds and tipping points that could result in irreversible harm and damage at huge cost to society. Thus, if we don't really know the answer, then it is incumbent on us to err on the side of caution rather than to take reckless risks.

Our economic valuations of ecosystem services can at least raise these vital questions, which are totally ignored in conventional accounting mechanisms that implicitly (and mistakenly) assign an arbitrary value of zero to nature. In other words, we need acknowledge that anything that we do to affect nature's balance is really an experiment with the system —

possibly a dangerous experiment — and we have to monitor what happens very carefully indeed. That is what ecological economics tries to do.

Because Bhutan is a small player on the world stage, whose greenhouse gas emissions for example account for only a minute proportion of the world's greenhouse gas emissions, its actions may have limited direct effects globally. But even small players can lead by example, as in Bhutan's declaration to the Copenhagen climate summit that it will remain a net carbon sink in perpetuity.

Indeed, the power of example cannot be underestimated, with effective demonstration of practical implementation possibly the only way to prompt other jurisdictions to follow suit. In Bhutan, transportation planning that reduces reliance on the automobile, for example, could check and curb the current increase in transport-related greenhouse gas emissions, and provide a model for other developing nations grappling with the same temptations to follow the western industrial model. In sum, the precautionary principle unites the indicators of sustainable development with precautionary *actions* based on the full-cost accounting measurement results.

### *A note on limitations of monetization*

'Economic value' in a full-cost accounting system must necessarily be defined far more broadly than in monetary terms alone. Monetization of non-market values and so-called 'externalities' is undertaken where possible, but for strategic rather than intrinsic reasons — primarily because such monetization creates a language and bridge to communicate with the world of conventional economics and accounting. Monetization is therefore seen as a necessary step to overcome the conventional tendency to attribute *no* value to non-market assets and values.

The reason for monetizing and using ngultrum values can perhaps be explained in the particular social and cultural context of Bhutan. When we see the fierce and ferocious faces of protector deities, as for example at Khamsum Yuelley Namgyal Lhakhang in Punakha or in the Memorian Chorten in Thimphu, we understand that ferocity is essential to counter the monstrous quality of ego and of harmful actions. So in our case here, the antidote actually looks a lot like the problem. Monetizing ecosystem values serves the same function. Because money is so dominant and the materialist lure so powerful in this day and age, we use the same tool — in fact its own instrument — to fight the battle against materialism. We are actually, strategically, using monetization as a skillful means here — using the same means and method that presently shore up our present GDP-based accounting and valuation systems, to defeat that narrow, materialist view and approach, and to expand our thinking and action into a much broader view and understanding of our actual assets and true wealth.

In terms of feasibility, economic valuations of non-market human activity are generally much more straightforward than economic valuations of natural capital and ecosystem services. For example, the use of market replacement values to assess the value of unpaid voluntary or household work makes intuitive sense, since similar work can be performed for pay. Also, monetizing the cost of crime is relatively direct since many costs are market-based — including direct victim losses, spending on police, courts, lawyers, prisons, security guards,

burglar alarms, hospitalization due to assault, retail losses due to shoplifting and employee theft, higher premiums due to insurance fraud, and productivity losses to the economy due to homicide or assault. Illness costs attributable to risk factors such as alcohol use, smoking, physical inactivity, and obesity are also market-based — either directly through taxpayer funded or private health care costs or indirectly through economic productivity losses due to premature death and disability.

But how do we assign an economic value to natural capital such as forests, agricultural soils, water, and clean air? And how do we assess the costs of their depreciation and the returns on investment in natural capital when we conventionally take 'free' ecosystem services for granted? While valuations of natural capital and environmental services certainly pose particular challenges, and while money is a particularly inadequate valuation tool in this area, the attempt to undertake such economic valuation is essential to prevent the under-valuation of natural wealth and to bring the necessity for adequate conservation and protection properly into the policy arena.

Putting a price tag on the value of many non-market values and assets is highly problematic, in large part because there are many such values that simply cannot be quantified. Indeed, money is, by definition, a highly inadequate valuation instrument and common metric for this purpose because it was designed to facilitate market transactions and was never intended to price assets and services outside the market economy. How, for example, can a dollar value be placed on a forest species, or on the habitat provided to that species, or on the beauty of an intact wilderness area, or for that matter on community vitality or world peace? Or, how can a dollar value be placed on the health of a child, or on community vitality? Money was not designed to assess such assets and simply cannot adequately capture the intrinsic value of the natural world or the value of a truly healthy and peaceful society.

On the other hand, this major intrinsic limitation of monetization does not mean that these assets have no economic value or that individuals would not be willing to pay actual money to preserve and enhance them. To take just one example, individuals do regularly pay for beauty and aesthetic rewards, as when they pay higher rent for an apartment with views of the mountains, parkland, or river than for one overlooking a polluting factory, strip mine, or dump.

This is not unlike insurance compensation for loss of a limb, or court awards for grief and suffering. Some monetary compensation is seen as essential to acknowledge actual loss and the fact that life and limb have real value, even though they are not traded in the marketplace. But there is no pretence that the award truly reflects the experience or extent of loss, or that it can fully and properly compensate for that loss. Similarly, indirect illness cost assessments in terms of economic productivity losses due to premature death and disability by no means reflect the full extent of loss in human terms, but have become necessary market-based proxies for more far-reaching values. In sum, the fact that something is not traded for money in the market economy does not indicate a lack of real and actual value. Therefore, monetization can be an important interim tool to acknowledge those real non-market values in a world dominated by market values, transactions, and considerations.

However, where monetary approximations are simply not possible, as they often are not — indeed some non-market values cannot even be properly quantified let alone monetized —

economic value must be described in non-monetary terms by pointing to the social and economic functions performed by natural, human, social, and cultural capital. For example, there is no question that having an educated populace is beneficial to society for a variety of reasons, but there is no methodologically rigorous way of putting a price tag on the economic value of a well-educated populace with the knowledge to fulfil its potential.

Despite the enormous challenges inherent in valuing natural, human, social, and cultural capital, and in pricing non-market assets and services, the methods and data sources available to do so have vastly improved and expanded in recent years — making a full set of new and expanded National Accounts more feasible than ever. Thirty years ago, for example, we had no reliable measures of greenhouse gas emissions, few comprehensive forest inventories, almost no scientific monitoring of soil, water, and air quality, virtually no diversion of solid waste from dumps, almost no systematic monitoring of health risks such as obesity and physical inactivity, no comparable international literacy assessments, and no time use surveys assessing time spent on unpaid work and free time. We now know how to measure these and other non-market values, and we have burgeoning databases and time series in these and other areas in many parts of the world.

Bhutan can use these databases to extrapolate values from other jurisdictions that might be similar to its own circumstances. Indeed such extrapolation methods were used in 2011 to undertake the first economic valuation of Bhutan's ecosystem services for the new National Accounts. In addition, Bhutan has a great deal of its own data available to begin to produce full-cost accounts. For example, the Centre for Bhutan Studies' GNH Survey time use data were used in 2011–12 to undertake the first ever economic valuation of voluntary work in Bhutan for the new National Accounts.

Considerable refinements and improvements are needed to improve the accuracy of these and other initial results. But beginning with simple assessments will point to areas where more specific data are needed in order to produce more detailed and accurate assessments in the future. Already these initial results, however crude, are a major advance over the previous conventional tendency to give these valuable assets a zero value.

### *A note on technical capacity*

This prospectus — written and intended for Bhutanese policy makers and civil service professionals — represents only one facet of what is needed to adopt and use the new National Accounts properly — namely understanding and political will on the part of government. We also urgently need to build technical capacity in full-cost ecological accounting methods by offering new courses and training programs, and by restructuring high school and university economics courses to include these methods and to adopt a more holistic approach that recognizes the social functions of the economy and its dependence and impact on the natural world. In other words, once we have designed our safe and effective aeroplane with its multiple gauges, we need to train pilots to fly it. If we have insufficiently trained pilots, we will continue to rely on old-fashioned and outdated vehicles that cannot measure our progress correctly or help us reach our collective destination.

In this regard, the Institute for Sustainable Solutions at Portland State University[27] has generously agreed to train local practitioners in the new methods, and to work

collaboratively with the Royal Government of Bhutan on incorporating natural, human, and social capital into the new National Accounts of Bhutan. To this end, as previously noted, world-renowned experts in this field, Dr. Robert Costanza and his team are committed to teaching full-cost accounting methods — and especially those related to ecological services — to policy makers, civil servants, faculty and students of the Royal University of Bhutan and others engaged in this process in Bhutan. They have also agreed to conduct hands-on data and methodology workshops on specific topics of direct relevance to Bhutan (such as assessing the carbon storage value of the country's forests with a view to seeking international climate change funding for conservation purposes) and thereby helping integrate these data and methods into the new National Accounts.[28]

It is also important to reiterate that, while building this technical capacity is essential in the longer term, present constraints are again no reason to hesitate in developing, using and applying the new National Accounts immediately. The reason is simply that what matters most in implementation is an understanding of the full-cost ecological accounting fundamental principles and approach. That is what this prospectus is designed to provide, and it contains many examples of related policy applications that are possible and full-cost accounting methods that can be implemented without delay. Once it is understood that the social and environmental benefits and costs of economic activity must be incorporated into policy making at all levels in order to ensure long-term prosperity, then the new National Accounts can be considered to be already in use even if full-fledged transformation and implementation will take time.

In North America, some First Nations groups have a long tradition that, in all major policy deliberations, one elder represents the interests of the seventh generation hence. That method and understanding are sufficient to ensure, for example, the sustainable use of resources. Thus commitment and understanding are the essential pre-requisites for adoption of the new paradigm and methods, and they create the enabling environment that then facilitates longer-term training and technical capacity building.

In sum, while greater precision, improved methodologies and data sources, training, and enhancing technical capacity are top priorities for effective implementation of the new National Accounts, current complexities and valuation imprecision constitute no reason for delay in adopting and using these methods. The overly simplistic present reliance on GDP and economic growth based measures, and the gross inaccuracy of assigning an arbitrary value of zero to real social and environmental costs and benefits, have proven far too dangerous and misleading to delay implementing a viable, comprehensive, and much more accurate alternative that is ready for use.

We already know too much to continue regarding the real costs of climate change, resource depletion and degradation, ill health, poverty, crime, and social exclusion as "externalities." Even beginning to account for those costs, however imprecisely, and beginning to value real assets like volunteer work, family time, safe communities, and vital ecosystem services that support life itself will constitute major improvements in evidence, accuracy, and knowledge over existing GDP-based systems, and will vastly improve the quality of policy formulation and deliberations.

## 3.3 Principles and general methods of full-cost accounting

*What you measure affects what you do. If you measure the wrong thing, you do the wrong thing, and our metrics direct our attention in one way or another.*

*- Joseph E. Stiglitz*

Although this prospectus mainly focuses on policy relevance and potential policy applications, this particular section is more technical and gives a taste of the kinds of complexities, methods, and technical issues involved in valuing non-market variables. The subsections that follow are akin to a brief explanation of a few sample dashboard gauges to someone visiting an airplane cockpit for the first time. They are obviously no substitute for the detailed training required to enhance technical capacity effectively and to implement the new National Accounts fully, properly, and in all their dimensions. That will require working closely with the Institute for Sustainable Solutions over time as outlined very briefly above and in more detail below to fully embrace the complexity of the new National Accounts and to work collaboratively to make the valuations ever more precise over time.

The Institute for Sustainable Solutions approach is briefly discussed at the end of this section under the subtitle "Levels of accuracy." Basically, it allows an ascending order of precision and sophistication, from a simple and quick set of valuations — using comparable information that is readily available in other jurisdictions — that can be applied without delay, to spatially explicit models designed specifically for Bhutan and its conditions, which require much more technical expertise. Because of this approach, from simple to complex, there is no reason to delay development of the new National Accounts using the data and technical capacity already present in Bhutan.

**Basic principles of full-cost accounting**

As previously noted, full-cost accounting refers to a form of cost-benefit analysis that includes environmental and social benefits and costs. Where possible, it attempts to monetize the value of non-market goods and services that are omitted from standard accounting procedures. Where monetization is not possible, a full-cost analysis describes the economic value of such non-market goods and services as comprehensively as possible using the best existing scientific data. The full cost accounting approach can provide a more comprehensive description of reality than is possible with the narrow, current-income approach of the GDP.

There are three basic principles of full-cost accounting — the methodology needed to produce the new National Accounts — which together can actually function to make the market economy much more efficient if adopted and implemented in practice:

### *1. Internalization of "externalities" or external costs*

Externalities are "transaction spillovers" that affect those who did not agree to the action that caused the externality. Abundant evidence indicates that such spillovers are more often costly than beneficial. By definition, externalities do not affect the monetary gain of their producers, since they are omitted from core accounts and transactions, but they do affect the quality of life of others.

Thus, a negative externality such as air pollution would not affect the revenues of the company that produced the pollution, but would cause problems in society as a whole. These spillover problems might include incurring economic costs to deal with the results of the pollution, e.g. treating chronic diseases of the population resulting from exposure to the pollution, or dealing with the myriad problems associated with climate change and greenhouse gas emissions. Companies that create negative externalities do not measure the economic costs of their actions or subtract the costs from their revenue, so their profits appear more positive than if they were held responsible for their actions.

*Internalizing* these external costs means that a company is required to be responsible for its actions and to pay the costs of any damages that occur. Thus, from a flow perspective, full-cost accounting internalizes 'externalities' such as the social and environmental impacts of economic activity, and thus assesses the true costs of production, which in turn should be reflected in market prices. If, for example, the full costs of pollution and greenhouse gas emissions were included in the cost of production and in market prices, imported food might become considerably more expensive than locally grown produce.

This example indicates that failure to internalize such costs that society actually bears, creates major market distortions. In particular exclusion of transportation-related externalities from accounting mechanisms, market transactions, and prices generally favours long-distance trade over local economies.

### *2. The economic valuation of non-market assets*

From a stock perspective, full-cost accounting recognizes and accounts for the economic value of non-market assets that are not traded in the market economy, but which nevertheless have real economic value. In assessing the value of a forest, for example, a full set of natural capital accounts will include not only the market value of the timber (as in conventional balance sheets), but also the value of its ecological services. These include the value of the forest in regulating the climate and sequestering carbon from the atmosphere, in protecting watersheds, in preventing soil erosion, in providing habitat for many species, and in providing aesthetic and recreational enjoyment.

From the perspective of a full-cost/benefit analysis, a 'healthy forest' is one that performs all these functions optimally. Indeed, the scientific evidence clearly shows that when the non-market values of a forest are compromised, the quality of the wood cut also declines. In that sense, full-cost accounting is far more in accord with science, the scientific method, and economic efficiency, than an accounting system that ignores the non-market values of natural, social, human, and cultural capital.

The economic valuation of non-market assets is described in considerably more detail below where we examine eight common methods used in such valuations, and discuss which methods are appropriate to which types of valuation.

### *3. The replacement of fixed with variable costs to the extent possible*

Replacing fixed costs with costs that are variable essentially means that costs are estimated and vary according to usage. To give a concrete example, fixed annual payments for car registration and insurance provide no incentives for conservation and no penalties for unsustainable behaviours. If costs were estimated (and payments varied) by type of vehicle, fuel efficiency, and number of kilometres driven annually, they would reflect a far more accurate picture of the actual social, economic, and environmental impacts of driving.

All three of these accounting principles — internalizing externalities, valuing non-market assets, and replacing fixed with variable costs — enhance market efficiency by pricing assets and economic activity more comprehensively and in ways that reflect actual production costs and benefits and costs to society at large.

## Basic full-cost accounting methodologies

To illustrate the challenges inherent in the internalization of externalities and in the economic valuation of non-market assets, below we briefly review some of the more common full-cost accounting methodologies. In addition, we will also review the basic steps required in valuation of natural capital assets and of ecosystem services.

Valuation means the worth or value of a particular good and service as reflected in its capacity to perform a function or achieve a defined goal effectively. Effective capital valuation therefore reflects the extent to which a goal is achieved or function performed when efficiency, fairness, and sustainability are specified as goals.

### *1. Replacement cost valuation*

Replacement costs methodologies assess the value of services that could potentially be replaced with man-made systems according to the cost of those replacement mechanisms. Thus, these valuations are derived by determining how much it would cost to replace non-market assets in the market economy. For instance, to assess the value of volunteer work, it is necessary to look at the type and number of hours of work performed by volunteers and then to assess how much it would cost to replace volunteer services for pay in the market economy. Similarly, the value of ecosystem services like flood control or water filtration can be approximated by assessing how much it would cost to replace these services (provided 'free' by healthy forests and wetlands) with manufactured products, infrastructure, or engineering technologies.

A classic example demonstrating the cost-effectiveness of reliance on natural watershed restoration and protection services to protect a municipality's water supply and the integrity of its water quality is New York City's purchase of the complete 4,144 square kilometre forested watershed in the Catskill Mountains that supplies the city's water. By the early 1990s, the city recognized that the development of villages, dairy farms, and other human

enterprises in the watershed was affecting the quality of its water supply. It then compared the costs of a new filtration plant to the cost of watershed restoration. City planners found that purchasing and restoring the integrity of the watershed would cost less than US$2 billion, while the filtration plant would cost almost US$11 billion in capital and operating costs just in the first ten years. In other words, the work of the watershed's forest and soils could save the city as much as US$9 billion over ten years.[29]

Thus, the money that would have been spent on the filtration plant can be taken as a proxy (or potential replacement cost) for the natural watershed protection value of the Catskill watershed's forests and soils. Yet that vital service — provided largely by a standing forest — is given a value of zero in our conventional economic accounts, which value only the timber produced by the felled forest. The new National Accounts, by contrast, would explicitly recognize the direct economic value of clean, natural environments in providing the services we depend upon for life support. They will, incidentally, also provide strong economic support for Bhutan's constitutional requirement to maintain a minimum of 60% forest cover in the country in perpetuity.

The burgeoning field of ecological economics has made remarkable advances in recent years in applying replacement cost methodologies and valuations to a wide range of natural capital assets and ecosystem services. In assessing the services provided by wetlands, for example, ecological economists have:

- Valued the storm protection services of coastal wetlands by assessing the cost of replacing these services by building retaining walls or levees;
- Valued wetland and forest erosion protection services by assessing how much it would cost to remove eroded sediment from areas downstream;
- Valued the spawning and nursery habitat services provided by wetlands by assessing replacement costs for fish breeding and stocking programs.

### *2. Avoided cost methodologies*

Avoided cost methodologies, also called damage and control cost assessments, are those that assess the value of certain services according to the degree that such services allow society to avoid costs that would have been incurred in the absence of those services. For example, the services provided by the atmosphere, forests, or soils in sequestering or storing carbon can be estimated by assessing the damage costs that will likely be incurred if that sequestration or storage capacity is compromised, depleted, or degraded by excess greenhouse gas emissions, forest cutting, or soil erosion. In other words, such damage costs can be *avoided* by conserving or maintaining the capacity of the atmosphere, forests, and soils to sequester and store carbon.

Thus, these costs are derived by assessing the potential damage resulting from an economic activity and then determining the cost to repair or to avoid such damage. Those restoration and avoidance costs are sometimes labelled "defensive expenditures," as they 'defend' against harm rather than enhance net wellbeing. For example, it is possible to use climate change models to assess in monetary terms the potential damage costs of each tonne of greenhouse gas emissions. Those potential damage costs can then be compared to the costs

of controlling emissions — as former World Bank chief economist Lord Nicholas Stern recently did in the UK — to assess the cost-effectiveness of different greenhouse gas reduction strategies and scenarios intended and designed to avoid those damages.

Other examples of damage cost valuations include:

- Cost of illness studies that assess the direct health care costs and indirect productivity losses attributable to preventable chronic disease and to risk factors like addictive alcohol use, obesity, and physical inactivity;
- Assessing the potential damage due to glacial lake outburst floods attributable to climate change, glacier melting, and water pressure buildup;
- The damage costs associated with ambient air pollution, which can be measured in terms of additional burdens on the health care system, lost time at work, and pain and suffering of affected individuals, and of acid rain induced environmental damages attributable to SOx and NOx acidification of lakes and forests;
- The damage costs associated with an increase in unemployment, which can be measured in terms of increases in illness, alcohol and drug addiction, disability, premature death, family breakdown, social unrest, and crime attributable to unemployment.

Attribution in the health care field is generally assessed through relative risk ratios (RR) derived from the epidemiological literature, which are then combined with risk factor prevalence rates (P) based on survey data, in order to determine the population attributable fraction (PAF) of each disease that can be attributed to the risk factor (e.g. alcohol use, air pollution, unemployment). Those PAFs are then applied to the public health databases (e.g. physician and hospital use costs) to assess direct and indirect illness (damage) costs. Please see Chapter 5 of this prospectus for more detail on these particular damage cost methodologies.

Control costs are the investments required to promote and improve wellbeing and to prevent the damages or potential damages being assessed. The cost-effectiveness of particular interventions can again be assessed (as in the climate change example above) by comparing control costs with avoided damage costs.

### *3. Factor income methodologies*

Factor income methodologies assess the value of ecosystem services in the enhancement of incomes. For example, healthy, sustainably farmed soils in which earthworms and micro-organisms flourish will *enhance the incomes* of organic farmers in the long term more effectively than depleted and compacted soils dried and hardened through excessive use of chemicals and synthetic fertilizers.

### *4. Travel cost methodologies*

Travel cost methodologies are based on the value of demands for ecosystem services as reflected in the costs of the travel required for effective utilization of such services. Market costs associated with such travel can then be used to reflect the implied value of the service

to the user. For example, the recreation value provided by national parks, including their preservation of biodiversity, flora and fauna that attracts nature-lovers, bird-watchers, trekkers, and others, might be implied by the expenditures of these park users on *travel* and associated costs (accommodation, food, payments to guides, etc.)

### *5. Hedonic pricing methodologies*

Hedonic pricing methodologies reflect ecosystem service demands as they are reflected in the prices people will pay for goods associated with or dependent on the preservation of such ecosystem services. For example, the aesthetic value of a natural viewscape might be reflected in the premium rental or purchase price of an apartment or house overlooking a beautiful park, unspoiled forest, or natural river compared to the rental or purchase price of an otherwise identical apartment or house overlooking a busy street or factory.

### *6. Contingent valuation*

Contingent valuation methodologies reflect demands for a particular ecosystem service as elicited through survey questions that pose hypothetical scenarios involving some valuation of alternatives. Such survey methods have been used in North America to assess the potential value to the public of species preservation, for example by asking people what they personally would be willing to pay each year to preserve the endangered spotted owl and to prevent its extinction.

Thus, contingent valuation is essentially a technique — often used for valuing ecosystem services or environmental resources — based on how much people would be willing to pay for a specific ecosystem service or environmental good. Contingent valuation is the most controversial of the non-market valuation methods, primarily because it generally relies on subjective assessments that may have considerably less precision than the more objective criteria underlying replacement cost, damage cost, and control cost assessments. However, contingent valuation methods may use objective as well as subjective evidence. For example, "willingness to pay" for wilderness conservation and protected areas can be assessed both by surveys (subjective) and also by examining actual behaviours (for example, how much people actually spend travelling to and visiting national and wilderness parks).

However, willingness to pay (WTP) as a tool to identify the value of complex systems such as wetlands or forest ecosystems has major shortcomings. According to Costanza et al. (1989):

> The economic value of ecosystems is connected to their physical, chemical, and biological role in the overall system, *whether the public fully recognizes that role or not*. Standard economics has too often operated on the assumption that the only appropriate measures of value are the current public's subjective preferences. This yields appropriate values only if the current public is fully informed.[30]

The contingent valuation method is also problematic because ecosystem services are not privately owned, and individuals may therefore not perceive the value of those services. For example, few members of the public understand the vital services provided by wetlands to human society in flood and erosion prevention; shoreline protection; storm control; water

purification; storage, recycling, and treatment of waste; carbon sequestration and storage; nutrient recycling, production, and storage; and provision of habitat, food, and spawning, breeding, and nursery grounds for a wide range of fish, shellfish, birds, and terrestrial wildlife. Not knowing those functions or their value, the public will not likely assign much value to wetlands in surveys, nor complain if they are drained, paved over, and developed.

In sum, the first problem with "willingness to pay" estimates is that the public is not fully informed about the true contribution of ecosystems to their wellbeing. Secondly, the general public has a very difficult time attaching an economic value to ecosystem services, because people do not use them directly and visibly to further their immediate interests and because they generally take those services for granted (e.g. the air we breathe) and are highly unlikely to recognize the full range of services provided.

WTP may be a useful tool to estimate what people are willing to pay for a restoration project where damage has become visible — cleaning up an oil spill or polluted river, or restoring a degraded habitat for example — but not to reflect the true economic value of ecosystem services. On the other hand, it has been argued that contingent valuation will more closely reflect true values over time as ecosystem goods and services gradually move to the forefront of the public mind in response to a decline in environmental quality and as individual interests are increasingly seen to be dependent on ecosystem health.

Contingent valuation has also been criticized because it values specific assets rather than an ecosystem as a whole, and may therefore miss critical linkages and interdependent relationships. However, many ecological economists argue that contingent valuation measurements are still far more accurate in at least acknowledging and recognizing the non-market value of nature's services than assigning these services an arbitrary value of zero, as conventional accounting mechanisms imply.[31]

Examples of contingent valuation include:

- Surveys assessing how much people would be willing to pay to maintain the existence of (or be compensated for the loss of) biodiversity in particular habitats;
- Surveys asking how much individuals would be willing to pay, beyond what they may already contribute in market expenditures (e.g. the entrance fee to a park), to ensure that a wilderness area is protected;
- Surveys asking individuals how much they would be willing to pay for preserving a critical habitat of an endangered species, such as that of the black necked crane.

Such contingent valuation surveys and assessment tools must therefore be used sparingly, cautiously, selectively, and only in those cases where the public has at least sufficient prior knowledge to attach some personal value to the preservation and protection of a particular ecosystem service.

### *7. Group valuation*

The group valuation approach is based on principles of "deliberative democracy" and the assumption that public decision making should result, not from the aggregation of separately

measured individual preferences, but from open public education and debate. This method has been shown to yield far superior and more accurate and realistic results than the contingent valuation methodologies based on individual preferences described above, since an open and skillfully facilitated discussion prior to administration of survey questions can produce the knowledge base and assessment of alternative options that will allow more informed valuations. This group valuation methodology was recently used in Canada to assess the value placed by the public on taxpayer-funded investments in renewable energy and what they themselves would be willing to pay for shifts from existing coal-fired power plants to a range of renewable energy sources.

### *8. Marginal product estimation methodology*

Marginal product estimation methodology is a sophisticated methodology that estimates the value of demands for ecosystem services. These are generated in a dynamic modeling environment using production functions to estimate the value of ecosystem outputs in response to corresponding inputs. Thus, the time and money people spend (inputs) to enjoy particular goods and services produced by a given ecosystem (its outputs) can tell us how much value they ascribe to those outputs in relation to the same amount of time and money spent on other goods and services.

This method recognizes that time, money and other means used to acquire goods and services are limited rather than infinite, so how people choose to spend these inputs reflects people's preferences and tastes, which in turn determines value. Because this valuation method is based on the reality of limited means and scarcity, the term "marginal" in this method designation simply refers to the fact that the scarcer an object is, the greater will be its value on the margin.

To use an overly simplistic example just to illustrate the point — the less people trust the quality of drinking water coming out of their taps, the more likely they are to have a preference for bottled spring water, to invest in a water filter, or to spend time boiling their water. What they are willing to spend on such water purification methods in money and time (compared to the same amount of time and money spent on other activities and products) provides an indication of the value they ascribe to drinking water quality. Indeed, the scarcer pure drinking water becomes, the higher will be its value on the margin, and the more likely people are to invest time and money to obtain it so long as it remains a significant preference and priority for them.

The choice of the valuation method will be influenced by the reality that certain non-market capital assets and the services they provide are more amenable to particular and appropriate methods of valuation. Multiple techniques might also apply to varying services. Therefore, a full suite of methods is generally necessary to assess the total economic value of a particular ecosystem, for example, with different functions of that ecosystem assessed by different methods.

**Steps required in valuation of natural capital assets and of ecosystem services**

There are 5 basic steps required in valuation of natural capital assets and of ecosystem services:

*1. Identifying ecosystem services*

This first step required in valuation of natural capital assets and of ecosystem services is actually identifying Bhutan's natural, cultural, and social assets and the key ecosystem, cultural, and social services these assets produce. Bhutan is blessed with abundant natural, cultural, and social resources — which it is committed to conserving and protecting — that provide a great many ecological, cultural, and social services. For example, the following were identified by about 70 representatives from a wide range of government agencies at a March 2011 workshop on valuation of natural capital and ecosystem services:

- Biodiversity — which in turn contributes to local, regional and global watershed protection; food supply; habitat protection; recreation such as bird watching, hiking, and ecotourism;
- Flood protection — protection for downstream settlements, including both southern Bhutanese villages and settlements far beyond Bhutan's borders; contributing also to reliable energy production;
- Water supply and quality — for irrigation, drinking, hydropower;
- Sustainable agricultural practices — seen as an asset that enables an organic, self-sufficient food supply (and concomitant non-reliance on imports and foods that are laced with additives, preservatives, and pesticides); contributing to protection of soils, traditional foods and seeds, and medicinal resources;
- Forests — providing carbon sequestration, climate regulation, prevention of soil erosion and landslides, habitats for many species, protection of watersheds, fuel and medicinal plants, and opportunities for aesthetic and recreational enjoyment;
- Air quality — providing services to human health, agricultural and forest productivity, aesthetic enjoyment;
- Wetlands — providing flood and erosion prevention; water purification; storage, recycling, and treatment of waste; carbon sequestration and storage; nutrient recycling, production, and storage; and habitat, food, and spawning, breeding, and nursery grounds for wildlife;
- Bhutan's rural population — seen as a major asset that enables sustainable land stewardship; preservation of farm and other labour; potential increased fallow land cultivation; cultivation of crafts; preservation of local languages and traditional knowledge; preservation of family connections (all of which, according to the March workshop participants, contribute significantly to human, social and cultural capital);
- Community harmony as social capital — providing services in farming collaboration; volunteering; shared management of natural resources, sacred places, and festivals; preservation of traditional values;
- Cultural capital — which preserves spiritual, religious, and aesthetic values, and supports traditional festivals, architecture, religious buildings, and sacred sites.)

A key question is: What actually happens when we lose major components of our natural and other capital? We currently know little about the long-term consequences and costs involved in natural, social, and cultural capital losses, in part because of the historical preoccupation of economics with markets, income, and consumption alone. But there is growing awareness and evidence of the gravity of these consequences and the magnitude of those costs — in the social and cultural spheres as much as the ecological sphere. In fact, even the notion of "scarcity" has shifted from that assumed in conventional economics. For example, with so many people stressed and overworked, time is often in shorter supply than goods, and there is growing appreciation that many people now need more time with each other, rather than more material consumption items, to improve their wellbeing and quality of life.

Ecological economists have also begun to tabulate the costs of natural capital losses that were often not previously related to human economic activity, but simply regarded as fortuitous events. Hurricane Katrina, for example, resulted in 1,400 fatalities and $200 billion in damages, and the huge magnitude of those losses turns out to have a significant relationship to human activity, in part through the paving over protective wetlands that were never previously appreciated or valued for the flood and storm surge protection they provided. So — in large part through the contribution of ecological economics — we are deepening our definition and understanding of the economy far beyond the narrow prior interpretations of conventional economists. And the world is now learning the hard way that if we lose an ecosystem service, there may be enormous financial consequences.

But the news is not all bad. On the contrary, we are also seeing the economic *value* and *benefits* of investments in conservation and ecological restoration. The Kingdom of Bhutan is in the enviable position, not only of having protected so much of its precious natural heritage, but also of learning from the grievous errors of other countries, and of not needing to make the same mistakes. As such, it is perfectly situated to be a beacon of hope for the vast majority of countries worldwide that have recklessly, and largely from ignorance and greed, embarked on the path of natural capital destruction, depletion, and degradation, and that now, albeit belatedly, seek to restore the value of their natural capital.

In identifying ecological services, it is also important to identify the challenges in the area of natural capital in Bhutan in which potential costs can be readily identified. Among the challenges identified by participants at the March 2011 workshop on valuing natural capital and ecosystem services are the following: forest fires, the danger of glacial lake outburst flooding (GLOF), other climate change impacts (e.g. changes in monsoon patterns), road washouts and landslides, the use of chemicals in agriculture and the challenges in sustainable agriculture, human-wildlife conflicts (HWC), and the challenge in retaining knowledge of the country's rich heritage of medicinal flora and traditional crops.

### *2. Identifying functions of ecosystem services*

Having identified Bhutan's key ecosystem services, the next step in any ecological economics analysis and natural capital valuation is to identify the primary functions of those identified ecosystem services. These functions can be divided into four basic categories:

Ecosystem services have:

- Supporting functions: such as providing pollination, biodiversity and habitat, nutrient cycling, and net primary production.
- Provisioning functions: These are actual goods, such as food, fresh water, wood and fibre, and fuel.
- Regulation functions: Unlike the 'goods' listed above, these regulation functions are services, such as atmospheric and climate regulation, flood regulation, disease prevention including maintenance of balanced predator-prey relations, preservation of water quality, soil erosion control, biological control, soil formation, and water regulation.
- Cultural functions: such as aesthetic, spiritual, educational, and recreational benefits.

These ecosystem service functions in turn affect the various constituents of human and social wellbeing, such as:

- Security: including personal safety, secure resource access, security from disasters;
- Basic material for a decent life: including adequate livelihoods, sufficient nutritious food, shelter, access to goods;
- Health: including access to clean air and water; and opportunities for exercise and recreation;
- Good social relations: including social cohesion, mutual respect, ability to help others;
- Freedom of choice and action for human beings to realize their potential.

In order to incorporate natural capital values into the national accounts, as is so necessary globally if we are to preserve these assets and not ignore and take them for granted, then these two first steps are essential in any research, analysis, and value assignation. In other words, after identifying Bhutan's vital ecosystem services that we seek to preserve, this second step involves (a) defining the functions those services perform; and (b) relating those functions to their direct contribution to human and social wellbeing. That provides the essential basis for any economic valuation process, since it directly links ecological services to the economic benefits those services provide to human society.

For example, if we identify key forest functions as including carbon sequestration; provision of high quality timber and of recreational and spiritual values; hydrological cycling; soil, watershed, biodiversity, and habitat protection; and so on, then each of those functions can further be related to their direct benefit to human society, including the provision of crucial life-support services. We can then define a healthy and valuable forest as one that performs all those functions optimally. In economic language, "depreciation" of natural "capital" occurs when those functions are performed less than optimally. This often occurs globally when a natural capital asset is exploited for only one of those functions like timber provision to the neglect of other vital forest functions. Thus, as noted, clear-cutting forests will make GDP go up when the timber is sold at market, but undermines the capacity of forests to

perform all their other functions (on which human survival, health, and wellbeing depend), resulting in a net loss of natural capital value.

In sum, identifying ecosystem service functions, and the explicit contribution of those functions to human wellbeing, provides the analytical basis for any natural capital valuation or revision of the National Accounts to include the value of Bhutan's natural wealth and the costs of its loss.

### *3. Valuing ecosystem services*

The next step in the process of natural capital valuation is actually quantifying the economic value of the services provided by natural capital assets and of the ecosystem functions they perform. To do this, there are now many reputable methodologies that have been explored and tested within the field of ecological economics — some of which were briefly described above — and which are now gaining increasingly widespread acceptance by conventional economists. That acceptance is largely due to the fact that the methodologies themselves have been adapted from conventional economics and simply logically broadened for application to other forms of capital than manufactured and built capital.

It is important to note that ecosystem service values will differ greatly by *land use type*. For example, highly fertile Class I soils with rich natural topsoil will perform different levels of service functions than shallower or more acidic lower class soils usable only for pasture rather than vegetables. That does not mean the latter soil types are *less* intrinsically valuable, since they may — at higher altitudes for example — perform vital watershed protection functions on which lower altitude fertile soils completely depend.

But for economic valuation purposes, what this example illustrates is that the very first thing that needs to be done in this step of the actual natural capital valuation process is to apply step #1 above to land use types — in other words to identify what ecosystem service exists by land use type (riparian buffer, shrub, urban green space, wetland, etc.). On that basis, we can then identify *what* can be valued.

Bhutanese analysts can now access and use the very extensive Ecosystem Service Valuation (ESV) Study Database, which contains more than 850 studies that ecological economists have produced over a number of years.[32] This excellent and still evolving database connects each ecosystem service and the value of its specific functions to a vegetation and land use type. Then, as the next step — at least in the initial phase of natural capital valuation in Bhutan — we can take the results of these studies and begin assigning monetary values to the services provided based on the number of hectares of each particular land use type existing in Bhutan.

At a second phase of development, we can become a lot more sophisticated by looking at the particular physical, topographic, soil and other conditions underlying the studies used to create the ESV Study Database, and we can then adjust the economic values assigned to ecosystem services in that database to Bhutan's particular conditions — based on the deep local knowledge and understanding of conditions here. But at least as a first phase, an initial natural capital valuation for ecosystem services in Bhutan was undertaken in 2011 based on

the land use-specific valuations in the global ESV Study Database, and on the corresponding land use types in this country. This valuation exercise at least provides some initial (albeit crude) natural capital and ecosystem service valuation results for this country to demonstrate the process. The report and results of this initial valuation by Dr. Ida Kubiszewski, Dr. Costanza et al. valuing Bhutan's ecosystem services using this type of simple transfer methodology, is being publicly released in February 2012 alongside this prospectus.

The ESV Study Database also provides two types of information that can create confidence in this process at least as an initial phase, and enable justifying its use comfortably for public presentation purposes:

1. First the total values provided in the ESV Study Database are not single numbers, but present a range of estimates ranging from the highest to the lowest values assessed in prior peer-reviewed studies in the literature. The estimates often differ due to the range of assumptions in different statistical modelling exercises. For example, climate change models yield a wide range of damage cost estimates depending on whether very conservative assumptions are used, or whether positive feedback loops resulting from permafrost melting and water vapour effects are included in the model.

In addition, most ecosystem service valuation efforts do not have adequate data to value all identified ecosystem service functions, and they therefore omit the value of key recognized functions due to data and methodological limitations — thereby inevitably producing conservative estimates that only partially value the services provided by particular natural capital assets.

The ecosystems prevalent in Bhutan's northern regions, like glaciers/ snow and barren land, have not yet been well researched and valued globally. Such ecosystems likely have significant values both as water sources and also due to their high recreation value. By determining the number of trekkers and how much they spend, a specific recreation value for Bhutan's glaciers/ snow and barren land could potentially be determined. However, because reliable valuations for these ecosystems do not yet exist, their value has been excluded from the initial estimation for the value of Bhutan's ecosystem services undertaken by Kubiszewski, Costanza et al.

As well, valuation estimates for those ecosystem services that are included in this initial valuation study are not comprehensive and exclude important functions for which reliable global valuations have not yet been developed. Thus, Kubiszewski, Costanza et al.'s initial estimate of the value of Bhutan's ecosystem services is certainly an under-estimate, due to exclusion from the valuation of those areas and ecosystem services in Bhutan for which adequate and reliable research and valuations do not yet exist globally.

Therefore, in this initial valuation phase, erring on the side of conservative or mid-range estimates ensures the credibility of the initial reporting. At the same time, the reporting of results can certainly indicate that, according to certain credible scenarios in the peer-reviewed studies, inclusion of key service functions presently omitted in the conservative estimates would significantly raise the actual estimates for ecosystem service values in Bhutan.

This method of reporting a range of results is very common in the ecological economics literature. In fact, the famous Stern Report, commissioned by the UK Government and authored by Lord Nicholas Stern, former chief economist of the World Bank, did precisely that when it estimated that the climate change damage costs from a "business as usual" scenario would amount to between 5% and 20% of global GDP, depending on the assumptions and models employed.

2. There is a second key reason to have confidence in this initial process of applying values from the ESV Study Database to Bhutan as a first step in the development of natural capital accounts, and in justifying its use comfortably for public presentation purposes: Any such bona fide attempt to ascribe value to nature's services, based on the actual functions performed — however rough such estimates may be at the beginning — are already far more accurate than the current system of valuing nature's services at zero, which is what GDP-based accounting does.

Ecosystem services actually support our lives and provide vitally important functions to human society — they *do* have actual value, including economic value. This can be easily demonstrated by the fact that, if we didn't have those services, the very best human societies could do (which would still be hugely inadequate if not impossible) would be to come up with very expensive engineering works to try to replicate nature's functions — like water filtration plants to replace the natural water filtration function that a standing forest performs, for example. So we know with certainty that a zero valuation for such vital ecosystem services, as in our conventional accounts, is completely wrong and misleading, and that even primitive efforts at valuation will therefore be superior to ignoring their value entirely.

In sum, for both the reasons outlined above, we do not have to apologize to anyone for starting our work with the transfer of values to Bhutan from existing reputable databases, and then gradually getting more sophisticated and precise as our work proceeds. That is actually good scientific method.

One concrete example of the vital importance of valuing ecological services comes from the Tibetan Plateau in this Himalayan region. The Tibetan Plateau is sometimes referred to as the water tower of Asia, because about 3 billion people depend on this area for their water supply. And yet this extraordinarily important ecological asset has never been seen as being worth anything in conventional economic accounts. Such economic valuation may not have been necessary in the past, because nomads have long maintained healthy grazing land on the Plateau, which in turn has performed a critical watershed protection function. Yet now the vital ecological services of the Tibetan Plateau are being disrupted both by climate change and by government policy in Tibet. It is this kind of human activity in this modern day and age, which threatens hugely valuable ecological resources, which no longer allows us to take our precious natural resources for granted, and which therefore requires us to make their value more explicit than was perhaps necessary in the past when their stewardship was more embedded in human lifestyles like nomadism.

Because the services provided by the Tibetan Plateau primarily benefit the huge mass of humanity downstream, which depends for its very life on this Himalayan region's water

supply functions, valuing its ecological services requires valuing the downstream benefits of the Tibetan Plateau. Three major rivers come out of Tibet — the Mekong, the Yangtze, and the Yellow river. The majority of China's industrialization is in the areas served by those rivers. As a result of disruptions to the Tibetan Plateau's ecological integrity, these areas are now experiencing greater floods and greater dry periods than in the past.

One analysis found that the annual benefits from the Tibetan Plateau's natural systems in Qinghai Province alone — just one province of China — range from a low of $12 billion to a high of $123 billion, depending on the assumptions and models employed. Making such values explicit not only demonstrates the dependence of our human activity on ecosystem services that are often taken for granted because they are out of sight and therefore out of mind, but can also powerfully influence government policies to pay more attention to conservation.

### *4. Mapping and modelling ecosystem services*

We have now looked at the first three key dimensions of the process of natural capital accounting and ecosystem service valuation — first, identifying key ecosystem services; second, identifying the particular functions performed by these services; and third, establishing an estimate of their aggregate value, which can initially be done by transferring basic values to Bhutan from the Ecosystem Service Valuation Study Database based on broad land use types. In the section of this chapter on "levels of accuracy" below, we describe how the precision and accuracy of these initial transfer value estimates can gradually be improved over time.

The next question and step in the valuation process is: When specific challenges and threats are identified, such as those briefly listed above, how do we map these problems across the landscape of Bhutan? Where, specifically, are these challenges most prevalent? For example some parts of the country are more at risk from glacial lake outburst flooding and from human-wildlife conflict than others. In short: How can we practically apply ecological economics methods and the reasoning behind valuation of natural capital and ecosystem services to the specific challenges faced in Bhutan where action may be most urgently required? This step is needed to move natural capital valuations beyond "academic" aggregate estimates and into specific policy applications.

This fourth step — mapping and modelling Bhutan's main ecosystem services — is therefore essential in order to refine the basic aggregate values established through the transfer of values from other studies and to specify the key providers and beneficiaries of ecosystem services, as well as those most at threat from potential declines in those services. This is done by a much closer examination of local conditions, which allows us to disaggregate the broad values, and is an essential step if we are to move this natural capital accounting work into the realm of practical policy application.

For example, payment for ecosystem service (PES) systems — discussed below in section 4.4 — can only be implemented if we know precisely what kind of conservation and protection services by which provider groups (potential recipients of PES) must be undertaken in order to ensure a reliable supply of such services to beneficiary groups

(potential payers of PES). This requires careful mapping and modeling of how particular natural capital assets and ecosystem services function in specific landscapes.

In this fourth step, the first questions to ask include:

- Which particular areas of the country provision which of Bhutan's key ecosystem services? Based on existing evidence, we can predict that these services generally originate in rural areas.

- What are the particular impairments to optimal ecosystem service functioning in those areas?

- Who are the key beneficiaries of these services? Here the evidence shows that the beneficiaries are generally urban or downstream areas. Basically, since we are trying to value ecosystem services provided to human society, the beneficiary areas are naturally those areas where people live.

The next part of this mapping and modelling step is to identify the carriers and flow paths of the particular ecosystem services under examination. These might include:

- Hydrological services, which are bounded by particular watersheds;
- Aesthetic view-sheds, some of which could potentially bring economic benefit to the tourism industry;
- Carbon sequestration, of which the beneficiaries are global;
- Other key service carriers and flow paths for recreational values, flood regulation, a wide range of ecosystem goods like medicinal herbs and other non-wood forest products, etc.

Such mapping could be done by region and district. For example, in mapping ecosystem services in the Bumthang area, the location of dwellings has already been mapped, but it would now also be most helpful for ecosystem service valuation purposes to map the key water sources for drinking water.

Such mapping can be done for a wide range of ecosystem service functions. For example, it is possible to model the flood protection services provided by natural systems. This will help clarify that enhancing natural capital, which naturally appreciates in value if conserved, can provide better and much more cost-effective protection against flooding than building man-made structures that depreciate in value and must be replaced over time.

In other words, the fundamental purpose of this fourth mapping and modelling step is to get much more specific in the analysis, which is essential for policy purposes and for the practical application of natural capital valuation. So, for example, we do not just want to know how many forests there are in Bhutan or the overall extent of forest cover — although that is obviously important as a first step — but we also need to know where the particular forests are that provide the greatest benefits for people downstream. Given that money is always tight, such analysis is essential to determine where particular conservation efforts will

bring the greatest return on investment. In other words, after the basic initial valuation effort (step #3 above), this fourth mapping and modelling step begins to take us into the realm of cost-benefit and cost-effectiveness analysis, which is what policy makers need in order to use natural capital valuations in the policy realm.

The mapping and modelling step is also directly relevant to the choice of valuation method, with different ecosystem services being utilized according to very different geographic ranges — ranging from global use and impacts to highly local ones. For example, atmospheric ecosystem services are often used and experienced globally, with greenhouse gas emissions in North America responsible for flooding in Tuvalu and Bangladesh, and carbon sequestration in Bhutan's forests ameliorating such global climate change impacts. Similarly, two weeks after the explosion at Fukushima, dairy cows in Oregon and California showed radiation from the reactor in their milk. Other ecosystem services and the impacts of their degradation are experienced much more locally, like the drying up of a spring or other water source, or an increase in asthma rates in the close vicinity of a polluting factory.

Value and cost estimates must account for that geographic range of effect. Here, we do not demonstrate in detail the methodologies used to account for such spatial considerations in natural capital and ecosystem service valuations. Suffice to say here that the value of a particular ecosystem service and the cost of its depletion or degradation are functions of several variables including scarcity, the degree to which a particular service is replaceable, the type of economic activity impacted, *and* the range and scope of impact — with wider spatial range usually magnifying benefits and costs. This is why mapping is so crucial in identifying providers and beneficiaries.

Five particular categories of spatial range and type in ecosystem service impacts are often identified and used in the ecological economics literature, and in ecosystem service valuation estimates:

- Global non-proximal (as in the climate change examples just mentioned);
- Local proximal (where impacts depend on proximity to the source, as in the example above of air quality decline in the vicinity of a polluting factory);
- Directional flow-related — flow from point of production to point of use (as in downstream, low altitude water supply or flood protection resulting from high altitude forest or watershed protection);
- In situ — point of use (as in the example above of the local spring used as a drinking water supply);
- User movement related (as in the example of nature lovers travelling to enjoy the unspoiled beauty of a national park).

The point here is simply that such spatial distinctions must be taken into account in value and cost estimates for natural capital assets and ecosystem services, particularly in applying such valuations for policy purposes.

### *5. Making practical policy recommendations*

The fifth and final step in the natural capital and ecosystem service valuation process is the actual translation of the findings and evidence into practical policy recommendations. In

fact, it is incumbent on ecological economics analysts to undertake this specific translation of evidence to policy implication as the final step in their analysis if they do not want their hard work to remain on the shelf as purely academic analysis. After all, there is a purpose to scholarly study and the search for evidence and truth, including natural capital valuation exercises, and that purpose is to create benefit both to human society and the larger world, which includes enhancing both sustainability and wellbeing.

This final analytical step — which consists of specific investment and policy recommendations — generally constitutes the concluding chapter in any study of ecosystem service values, and is often the core of the study's executive summary and subsequent news releases. In fact, having the evidence to inform policies that bring benefit to Bhutan is the whole purpose of creating the new National Accounts, and throughout this prospectus we have therefore provided examples of enlightened policies that flow from use of ecological economics and full-cost accounting methods.

**Key questions to ask in the valuation process**

There are five key questions, each of which is essential to ask when undertaking any natural capital and ecosystem service valuation. These questions demonstrate the basic common-sense logic of the natural capital valuation process, and show that those engaging in this process in Bhutan are fully capable — given their already existent knowledge of Bhutan — to embark on this process in the most practical and applied way within a Bhutanese context.

It is important to emphasize that these five basic questions are absolutely core to any economic valuation of ecosystem services, form the framework of all such studies, and actually reflect the key steps that analysts have to take in gathering, processing, and reporting information. While the materials presented so far may possibly create trepidation that the natural capital valuation process is too methodologically complex and too conceptually challenging to undertake effectively, these key questions can provide the confidence to realize that the valuation process is actually based on straightforward common sense and that informed Bhutanese already possess the understanding, familiarity, and knowledge required to embark on this path. In many cases, the valuation process is often a matter of giving statistical and quantitative weight to what is already intuitively known just from living here and observing the world and through existing professional work in the field. Backing up that existing knowledge with hard evidence and adding the economic valuation dimension simply strengthens the case for action that most policy makers already know is needed.

It is also important to note that the context for these valuations is basically positive — rather than the gloom and doom context in which environmental issues are often discussed that simply makes us depressed and despairing. In fact, the whole natural capital and ecosystem service accounting and economic valuation process is based on the premise that our true wealth is much greater than our narrow GDP-based measures and conventional balance sheet accounts, which confine asset analysis purely to manufactured and financial capital, indicate. By identifying and recognizing those larger natural assets, and by making their value explicit, the nation actually becomes much "richer" than ever conceived. So valuations are based on such positive thinking and wish to protect, maintain, and enhance the nation's real

wealth, prosperity, and wellbeing, and the five key questions below are designed to foster that positive valuation process.

Those five key questions are the following:

### *1. Is the particular ecosystem service abundant, increasing, static, or declining?*

Once a particular ecosystem service and its functions have been identified, it is important to ask whether that particular ecosystem service is abundant, increasing, static, or declining. Although ecosystem services mostly refer to "flows," ecosystem service flows originate from natural capital stocks. For example, a healthy forest (a natural capital stock) may supply downstream flood protection services (a flow). So this first question actually corresponds to a "stock" assessment that is measured in physical terms, and links the health of the stock to its capacity to provide the service flow. The answers to this question are most likely already known from knowledge of this country and the professional work that has already been undertaken. Thus, a rough sense of which natural capital assets and ecosystem services are abundant, increasing, static, or declining is probably known.

Another way to think of this question is that it provides the "indicator" base for economic valuation. As previously discussed, there are two basic types of measurement — measures of progress, which are assessed by indicators, and measures of value or worth, which are essentially accounts. The former are assessed in physical terms and the latter in economic terms. For example, smoking, crime, and greenhouse gas emission rates are indicators that tell us whether these trends are abundant, increasing, static, or declining — as this question asks — and these indicators are measured in different physical units, like proportion of the population who are smokers, different categories of crime incidence per 100,000 population, or tonnes of greenhouse gas emissions. The corresponding measures of economic valuation are the costs of smoking, crime, and climate change to society, which can be measured in common monetary units.

The physical evidence provided by indicators is always the basis for any economic valuation process. So this first question asks that basic indicator question on whether the service is abundant, increasing, static, or declining.

### *2. What are the key sub-categories within each service?*

In any economic valuation of ecosystem services, one never simply comes up with a total figure for the economic value of that service. Such totals are always aggregated from a number of different sub-totals reflecting the value of each sub-category. If, for example, we are assessing recreational services provided by nature, we can ask what sub-categories exist in the recreation realm — like walking, picnicking, bird-watching, enjoyment of aesthetic viewscapes, and so on. Unfortunately, there are no short-cuts here. When we build a set of accounts, we always have to break down each overall category into its component parts, and then assess the trends and values within each sub-category before aggregating them for a total estimate.

So this second question leads to the second essential process in any economic valuation exercise — namely considering what sub-categories there might be in any assessment of the health and value of a particular ecosystem service.

### *3. Who are the main beneficiaries of the listed ecosystem service, what are the key threats to continued provision of the service, and who are the service providers?*

In addition, it is important to determine who the *beneficiaries* are in this ecosystem service (the benefits side of the equation), what are the *threats* (costs side), and who are the *providers* of the service (who add value to the service through their stewardship activities)? This third question is the beginning of the transition from indicators to economic valuation. Again, like the previous question, this one involves some disaggregation in the ecosystem service valuation process.

Thus, to assess value, we must ask for *whom* a particular service has value, and *what* particular service and value are provided — these are the beneficiaries. In order to assess the costs of natural capital depreciation and ecosystem service decline — whether in the form of quantitative depletion or qualitative degradation — we must then identify the particular threats that exist to the ecosystem service that is being considered, whether population growth, excess harvesting, pollution or contamination, or other cause. And if we want to add value through stewardship or restoration, we have to ask who those service providers are in order to assess the worth of their contribution. So this third question is the essential transition to the economic valuation process.

Also, once the ecosystem services, their functions, and threats are identified, it is also important to prioritize the key challenges, threats and problems that need to be addressed in Bhutan. Identifying the priorities facing the country will help to choose which ecological services to study in depth and decide where to start.

### *4. What data are presently available in Bhutan to answer those questions?*

Here is where professional expertise will provide the answers in identifying both present data availability and data gaps and needs. In answering this essential question, with which every researcher and analyst in the field always has to deal, one finds the whole is considerably greater than the sum of the parts. In each of the different specialized areas, there is knowledge of some portion of is the data currently available, and when this collective knowledge is pooled, it is normal to discover that considerably more useful data already exist than each individual specialist would have assumed. The March 2011 natural capital valuation workshop made several remarkable discoveries of existing data that surprised participants, who had not realized that another division or agency had highly useful data of which they were previously unaware.

### *5. Where are the key locations of the services and threats?*

It is important to know where each ecosystem service is found, and where particular threats exist. This fifth question corresponds to the 'mapping and modelling' phase described earlier

and simply acknowledges that costs and benefits are not equally distributed within a country's geographical boundaries. For example, in the area of water supply, there are certain places where water sources are drying up, while other locations have storage or technological problems. Some areas are biodiversity hot spots while others have seen losses of key species. Some valleys are particularly prone to glacial lake outburst flooding, while other regions provide natural flood protection services.

This crucial question also recognizes the flaws in aggregate national 'averages.' A favourite joke among statisticians is that if someone has his head in the refrigerator and his feet in the oven, then "on average" his body temperature will be just fine. So this mapping question challenges that misapprehension, and requires us to disaggregate our data to identify where in Bhutan key services and threats exist.

This question also marks the vital transition from analysis to policy application. In order for government to prioritize and make wise investments in natural capital in a world of scarce and limited resources, it must know where the needs are greatest, where the most essential ecosystem services requiring protection exist, where immediate threats must be countered through regulation or penalties, where restoration of depleted or degraded services is most urgent, and where the most cost-effective investments should be made.

In sum, these five questions point to key analytical steps in the process of valuing natural capital and ecosystem services. These questions give a practical idea of the thinking that goes into natural capital and ecosystem service valuation. They also demonstrate that — based on existing professional knowledge and familiarity with the country — there is already a very strong foundation in Bhutan to undertake the economic valuation tasks required and thereby to verify and quantify what is already intuitively known and sensed. Answering these questions will open that door. Again, the five simple questions are:

1. Is the ecosystem service abundant, increasing, static, or declining?
2. What are the key sub-categories within each service?
3. Who are the main beneficiaries of the listed ecosystem service, what are the key threats to continued provision of the service, and who are the service providers?
4. What data are available to answer those questions; what data gaps presently exist?
5. Where are the key locations of the services and threats?

**Levels of accuracy**

Four basic levels of accuracy, which should always be made explicit and transparent in any analysis to ensure its credibility, can be distinguished in ecological economics methodology. Making such distinctions explicit allows analysts, including those in Bhutan, not to be daunted or put off by the complexity and challenges of natural capital valuations, but rather to begin quickly and simply to come up with some initial broad-based numbers without delay, and then gradually to improve the level of accuracy, sophistication, and precision over time.

These four levels of ecosystem service analysis are briefly described below in ascending order of precision and sophistication, beginning with the simplest, quickest, and easiest set of valuations that can be applied without delay, and moving towards much more sophisticated

and accurate analysis. In fact, the first two levels of accuracy below are fairly simple to apply, and do not require expertise to begin the valuations beyond what is already presently available in Bhutan. These four analytical levels are:

### *1. Basic value transfer*

This level of analysis assumes that natural capital and ecosystem service values are relatively constant over ecosystem type. This is the least complicated level of analysis and can be applied in Bhutan without delay. Thus, if there is a value for a particular land use type that has already been determined in the existing ecological economics literature, we can at least get started by applying that value to the same land use type in Bhutan. This is not as primitive as it might sound, as those values in the literature are generally in peer-reviewed studies, use a combination of several valuation methodologies referenced above as appropriate to ecosystem function, and — at least in meta-analyses — are often based on a wide range of topographical conditions.

To undertake such a basic value transfer study for Bhutan's natural capital, based on the existing literature found in sources like the Ecosystem Service Valuation Study Database developed by Earth Economics, mentioned above, what is needed is a good land cover map with land cover types and classes, which is available in Bhutan. Basically, a table with values for each land cover type, based on Bhutan's particular land cover classes, can then be generated by examining the literature. An initial value transfer estimate for Bhutan could then be made by applying data from other regions according to comparable land use types. Assembling such an initial table of natural capital and ecosystem service valuations using the basic value transfer approach would at least produce a rough first estimate of the value of natural capital in Bhutan.

As mentioned above, Kubiszewski, Costanza, et al. have prepared just such an initial assessment of the value of ecosystem services in Bhutan using a quick and cost-effective benefit transfer methodology. They have summarized these results in an article, titled "Ecosystem Services in Bhutan," which is being released in February 2012 alongside this prospectus.

Another credible example of this kind of basic value transfer analysis can be seen in an online article titled "The Value of New Jersey's Ecosystem Services and Natural Capital."[33] That study simply applied to the U.S. state of New Jersey a basic land cover typology according to average ecosystem service values per hectare derived from existing databases and literature for other jurisdictions. Both for Bhutan and New Jersey, these relatively simple, quick, and straightforward studies have enabled the natural capital valuation process to get started without delay, and without initial requirements for time-consuming and expensive new data collection.

Such an initial basic value transfer analysis and its first, preliminary results can be refined, improved, and made more sophisticated over time using the higher level analytical methods described below. A first improvement step would be for GIS experts in Bhutan to produce maps of each ecosystem service, which in turn would allow more nuanced application of the value transfer approach. But the key point here is that the Kingdom of Bhutan has the big

advantage of not having to start from the beginning. Rather, Bhutan can build on all the prior valuation work already completed by Dr. Costanza, David Batker, their teams, and many other renowned ecological economists, and extrapolate those results for Bhutan.. Thanks to the generous expert contributions of Drs Kubiszewski, Costanza et al. this first step has now been accomplished. Then, at later stages, these experts, working closely with their Bhutanese counterparts, can help to refine and adjust the numbers over time as indicated in the other levels described below.

It is worth beginning with this simple basic value transfer just to begin communicating the concept of economic valuation of natural capital to policy makers and the public. As previously mentioned, that notion is actually common sense because it simply recognizes and acknowledges that natural capital does provide very valuable services to human society that have real economic value and that provide actual and identifiable economic and social benefits. So starting out even with the simplest approach can intuitively help policy makers and the public to begin to think in these terms, rather than simply taking ecosystem services for granted as has been the practice globally due to their invisibility in conventional accounting mechanisms and measures of progress. By itself, even this first level of information can produce impressive results, and the basic comparison to the GDP can be very powerful.

Of course, it is important not to imply greater sophistication to this initial analysis than is warranted and to be completely transparent about the extrapolation techniques used. It is also necessary to insert whatever caveats are required about data gaps and uncertainties. To give just one example, Bhutan has a lot of snow, ice, and rock cover, and there are not presently a lot of studies on the ecosystem service value of these land cover types. So if there are such gaps in the existing Ecosystem Service Valuation Study Database and other valuation tables from which values for Bhutan are extrapolated, then the ecological literature must be examined to identify what studies might have been done on the services provided by these particular ecosystem types. If nothing sufficiently credible and usable for this initial basic value transfer exercise can be found in the literature, as was the case with the initial study just completed for Bhutan, then this is identified as a data gap that needs to be filled as we move forward.

### *2. Expert modified value*

The next level of precision simply requires that a group of experts adjust the basic transfer values based on local conditions. For example, such experts would identify where lower, medium, and high quality forests exist in the country, based partially on the age and species diversity of particular forests, whether they are old-growth or second-generation forests, and so on. In other words, a kind of expert opinion survey would be used to adjust the values for actual local ecosystem conditions. According to Dr. Costanza's observations during his training visit here in March-April 2011, Bhutan already has access to tremendous local expertise that will enable this higher level of precision to happen without delay, simply by pooling and sharing the knowledge within its various agencies and departments.

### *3. Statistical value transfer*

Beyond simply consulting and polling experts, the next higher level of analysis would require building a statistical model of special and other dependencies, thereby accounting statistically for Bhutan's unique soil, topographical, climatic, and other conditions, and then adjusting values transferred from other studies and jurisdictions accordingly.

### *4. Spatially explicit functional modeling*

There are more sophisticated levels of analysis that are possible beyond those three initial levels. For example, it is possible to go beyond any kind of simple transfer and adjustment of existing values from other studies and other jurisdictions by building spatially explicit models designed specifically for Bhutan and its conditions. In some cases, this is not as daunting and challenging a task as it sounds, as it may possibly require simply incorporating valuation into physical models that have already been developed. To give just one example, analysts are now in the process of developing a very detailed and sophisticated inventory of Bhutan's forests, which will have explicit information on age and species diversity and a wide range of other variables not hitherto captured in existing data sources. Deriving sophisticated natural capital and ecosystem valuations from such an inventory will certainly be possible, thereby quickly vaulting the initial transfer-based estimates to much higher levels of accuracy and precision.

As Bhutan actually builds the natural capital accounts over the coming years, analysts can learn in greater detail how to use these various methods, and the circumstances in which different methods are most applicable and useful. However, as mentioned, it is quite important not to wait until the perfect, most precise, and sophisticated analytical tools are available — because then one might never get started — but rather to begin wherever we can in order to bring this way of thinking into the public arena. Because this natural capital and ecosystem service accounting is the leading edge of a far-reaching new sustainability-based economic paradigm that properly and comprehensively accounts for a nation's true wealth, and because adoption of this paradigm is urgent given the pace of environmental destruction world-wide, it is important to demonstrate the value and policy relevance of the new accounting systems without delay. Later, as the new National Accounts develop and analysts become increasingly familiar with the valuation methods over time, valuations can become increasingly accurate and sophisticated in analysis, moving gradually up the four-step ladder of analytical levels outlined above.

The same logic applies directly to the use and application of the new National Accounts as a whole. While efforts must continue unabated, and indeed with renewed energy and vigour, to improve evidence, methodologies, data sources, precision, training, study, and other aspects of rigorous scientific investigation, current imperfections and imprecision are no reason not to adopt and use the new National Accounts at this time. This full-cost accounting approach is an essential component of informed and intelligent policy making. We literally ignore full-cost accounting of natural, human, social, and cultural capital assets at our peril and do a disservice not only to ourselves but to future generations if we continue to use current discredited and misleading measures to assess our prosperity, wellbeing, and progress. Perhaps most importantly, the complexity of the new National Accounts in integrating social, economic, cultural, and environmental realities must be embraced rather

than denied if we are not to stumble forward blindly into the future and if we wish to leave our children a legacy of which we can be proud.

**Case study: Avoided costs example: New Orleans, Louisiana — Hurricane Katrina**

By way of illustration, we include here a brief example of an application of avoided cost methodology that Costanza and his team used in a study on how wetland preservation in Louisiana could have blunted the force of Hurricane Katrina and avoided at least some of the massive loss of life and damages caused by that devastating hurricane.

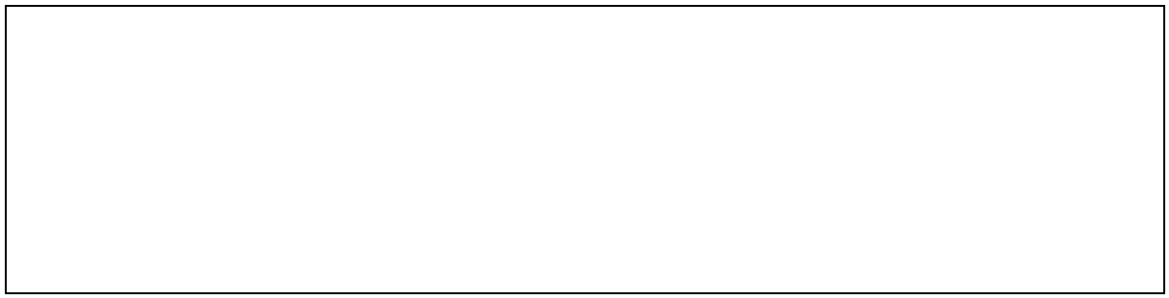
In this study, they began by collecting data on storm tracks; on where the wetlands historically were and currently are; and on where the region's social and economic infrastructure, including population centres, industry, and built capital, is located. They also tabulated the total damages of various storms, including Hurricane Katrina, and collected data on maximum wind speeds during these storms and hurricanes.

Based on all these and other relevant data, Costanza and his team then built a statistical model that enabled them to create an equation to find the total damages (assessed as losses to GDP) observed for a range of storms. They then used this equation, along with the wetlands and other data, to map the total value of wetlands storm protection services. Finally, they took all that information and aggregated it to draw conclusions such as: *A loss of 1 ha in wetland in the model corresponds to an average $33,000 increase in storm damage from specific storms.* Phrased positively, they were also able to use their model to create a rough estimate of the total value that coastal wetlands in the United States presently provide in storm protection services.

These results will now hopefully be used to make an economic case for wetland conservation, protection, and restoration — the value of which was not properly appreciated previously. In this case, the demonstrated benefits are shown in terms of potential *avoided* damages. Such accounting and valuation exercises can be very powerful policy tools, reaching wider non-environmentalist audiences and influencing policy in ways that ecological arguments based on physical data alone cannot do. For example, in this particular case, the U.S. Army Corps of Engineers, which designed and built the levees that were supposed to protect New Orleans, has finally developed a new appreciation for the economic value of wetland storm protection services and for the cost-effectiveness of relying on such natural wetland services rather than solely on man-made engineering structures that depreciate over time and proved ineffective in protecting New Orleans.

- Potential accounting domains and components
- Using the new National Accounts in the policy arena
- Policy implications of valuing true wealth
- Examples of enlightened public and private sector policy making





*There may never be a better time than the present — while the conventional system is in crisis and the so-called experts are wringing their hands — to seize a golden opportunity to present a new and saner economic paradigm that accounts properly for what truly matters to us.*

Now is a good time in Bhutan to start preparing the ground for a new way of accounting. Through practice and application, policy-makers can demonstrate that these new core measures of true wealth and valuation are a viable and visionary alternative to the present growth-centred paradigm.

While acknowledging the limitations of a departmental, sector-specific approach to what is basically a holistic and integrated measurement system, this chapter also acknowledges that we must begin from where we are. Because government is presently structured departmentally, the following pages therefore:

- suggest potential accounting domains and components,
- present examples of practical ways in which various government departments can begin using the new full-cost accounting system for decision-making purposes in policy areas,
- provide some examples of policies that reflect the vision and approach of full-cost accounting methods.

## 4.1 Structure of the new National Accounts: Potential accounting domains and components

As discussed above, in order to produce the new National Accounts, both indicators and accounts are needed. Also as noted, indicators are the statistics that are based on physical measures such as employment, crime, poverty, and illness rates, levels of educational

attainment, greenhouse gas and air pollutant emissions, etc. On the other hand, accounts assess value, with units of measurement expressed in common monetary terms to the extent possible. The accounts depend on the data and evidence provided by the indicators.

Bhutan already has sufficient sources of data to begin developing the new National Accounts. For example, the National Statistics Bureau collects data from government ministries in areas such as agriculture, forests, and the environment that can be used in the full-cost accounting measurements of natural capital and ecosystem service values.

In addition, a new and important data source is the GNH Index, developed by the Centre for Bhutan Studies, with data now available for 2007 (with limited sample size) and for 2010 (with much more robust sample size). The GNH Index consists of 72 core indicators in social, economic, and environmental areas that are included within 9 domains: psychological wellbeing, time use, community vitality, culture, health, education, environmental diversity, living standards, and governance. The GNH survey itself has a wealth of additional data beyond the 72 core indicators. It is important to acknowledge that the nine GNH domains are inter-related and interdependent, and it is therefore necessary to examine how they connect with and influence each other. In other words, though it is necessary to create separate domains for measurement purposes, the whole is much more than a sum of its parts.

While the existing GNH indicators and 9 domains will provide key components of the new National Accounts database, the *structure* of the new National Accounts will be that of an expanded capital framework that includes natural, social, cultural, human, and produced (built or manufactured) capitals. This is necessary because, as noted above, economic valuations use common metrics (monetary valuations to the extent possible) and therefore require such a common capital framework that allows concepts like 'depreciation,' 'costs,' 'benefits,' and 'investment' to be applied in a consistent way to all components of the new National Accounts.

In the beginning, when developing the new accounting system, data availability and methodological rigour will help dictate the choice of which valuations are initially undertaken, and this menu can be gradually expanded as more data become available. In the realm of human capital, for example, existing data sources and well-developed methodologies exist to begin assessing without delay the costs of preventable illnesses in Bhutan and the cost-effectiveness of particular disease prevention and health promotion initiatives. But far more work still needs to be undertaken to establish viable and reliable indicators of an educated populace, and to collect appropriate data, before any economic valuations in this field are feasible.

Table 2 below shows a list of capital domains and some examples of potential constituent components, to provide just one example of how a new accounting system could be organized. As noted in the human capital example above, some of these components are more amenable to valuation based on existing data than others, and so the accounting framework will gradually need to be filled in over time as new data become available. Information concerning specific possibilities for what might be considered in specific valuations in some of these areas and how those results might potentially inform policies is presented in the following sections.

**Table 2. Examples of domains and components in a potential full-cost accounting system**

| *Valuing true wealth: potential domains and components for the new National Accounts* | |
|---|---|
| **1. Social Capital**<br>Civic and voluntary work<br>Community safety and security<br>Social networks and supports<br><br>**2. Human capital**<br>Population health<br>Educated populace<br>Leisure time<br><br>**3. Cultural capital**<br>Religion<br>Indigenous languages<br>Traditional arts<br>Indigenous knowledge | **4. Natural capital: stocks and ecological services**<br>Soils and agriculture<br>Forests<br>Air quality<br>Water quality<br>Energy<br><br>**5. Natural capital: human impact on the environment**<br>Solid Waste<br>Ecological footprint<br>Greenhouse gas emissions<br>Transportation<br><br>**6. Produced capital**<br>Paid work hours and employment<br>Income distribution<br>Economic security (safety net)<br>Unpaid household work and child care<br>Financial security: personal assets, liabilities, and wealth<br>Business infrastructure (plant, equipment, liabilities)<br>Public infrastructure (roads, bridges, buildings, public debt) |

Each domain of the proposed new National Accounts measurement framework will need to consist of several different components and sub-components. Thus measures of population health, for example, may constitute one *component* of the proposed framework for measuring the human capital domain. That component (population health), in turn, will include several sub-components on the socio-economic, environmental, behavioural and other determinants of health, with different valuation and costing studies within each of these sub-components. The behavioural determinants, for example, could include separate studies on the costs of tobacco use, costs of alcohol use, costs of overweight, and costs of physical activity.

Careful aggregation among the sub-components, taking particular care to avoid double-counting, will then be necessary to produce a composite estimate of the costs of preventable illness in Bhutan. In order to identify the most effective disease prevention and health promotion interventions, the results should specify which causal factors, locations, and demographic groups are responsible for the highest costs.

As well, the data set for each sub-component must also be carefully examined with a view to identifying cost-effective policy interventions in different areas. Excess alcohol consumption, for example, is not evenly distributed through the country and therefore the highest costs of alcohol use will likely be concentrated among particular demographic sub-groups, where the most cost-effective interventions can likely be targeted. Therefore, the data must be examined by gender, age group, rural-urban distribution, employment status, and other characteristics to assess the highest costs and the targets of policy intervention.

While such a study sounds daunting, the good news is that robust methodologies and many data sources for such work exist. Where existing data sources are not presently available, hospital, physician, and pharmaceutical databases, such as information on average hospital stays for particular diseases, can be used to create the necessary costing databases. The initial compilation is hardest, but later updates can be undertaken with relative ease, so that it is eventually possible to assess the magnitude of increased or reduced costs associated with particular increases or declines in alcoholism, tobacco use, and other risk factors. Such evidence is the basis for informed policy making to improve population health.

Similarly a component of the natural capital domain like soils and agriculture may have sub-components on soil quality and productivity, water availability and quality, biodiversity, livestock health, input use efficiency, and farm economic viability. The soil quality sub-component in turn may include measures of soil organic carbon, soil structure, soil erosion and conservation, and soil food-web health.

Again, this complexity should not be a deterrent to developing the new National Accounts, since the Ministry of Agriculture (and particularly divisions like the National Soil Services Centre) already has much of the needed data readily available, as determined during the March 2011 natural capital valuation workshop. On the contrary, agencies like NSSC will be very pleased to see their existing data so effectively used for the new National Accounts and in the wider policy arena.

It is very important for users of the new National Accounts to be able to "drill down" as far as they need from the broadest categories to the most detailed sub-components — for at least two key reasons. First, for policy planners and managers hoping to use the accounts to guide policy development, the availability of this deeper level of detail is crucial, even if the detail is not present in summary annual reports. Indeed, to be cost-effective, any policy intervention will require such deeper and more detailed knowledge in order to assess where the greatest gains are to be expected. Secondly, reporting credibility is enhanced if causal questions can be answered with some knowledge or understanding, and with reference to questioners' particular interests that may not be reported at the grossest or most aggregate summary level.

Thus, for public reporting purposes, it is essential to have a small number of broad categories and components in the new National Accounts reporting framework. However, both for policy and analytical purposes, it essential to structure the framework so that all *levels* of detail are represented and linked to each other — from the broad components of the accounts to the constituent sub-components and costing categories, to the socio-demographic breakdowns of those categories.

Again, so that this complexity does not become a deterrent to implementation, it must be emphasized that none of this is different in essence from the way the conventional National Accounts are currently reported. An overall result on changes in GDP, in inflation, or in any other standard economic measure, still allows drilling down to information on particular economic industries, sectors, and consumer items. For example, the average GDP growth rate is insufficient to tell the whole story of which industries are growing fastest and which are declining, and average inflation rates still require more detailed information on the particular rates of inflation of food items, fuel, cars, electronics, recreation, and other expenditures in order to be reported meaningfully and for policy purposes. Reporting of natural, social, cultural, and human capital results in the National Accounts will simply require a similar level of disaggregation in their own fields.

**Linkages among components and capitals**

As well, none of the components of the new National Accounts framework should be viewed in isolation. Indeed, the fundamental purpose of an effective full-cost accounting framework should be to elucidate the linkages and connections among diverse data sets. At a deeper philosophical level, one might even say that the fundamental *raison d'etre* of expanded capital reporting itself is its understanding of the interconnected nature of reality. That is the fundamental reason for a reporting and valuation framework that spans the social, economic, cultural, and environmental aspects of wellbeing.

Thus, to take the examples above, particular valuations of population health like the costs of alcohol, for example, will be linked to other components of the accounting framework like educational attainment, employment, and living standards. For example, one of the costs of unemployment is substance abuse, while excess tobacco and alcohol use has also been linked to overwork, stress, poverty, and illiteracy. One Canadian study estimated the costs of excess physician use attributable to educational and income inequality, and a Statistics Canada study found higher hospital costs among low-income groups. In other words, the costs of preventable illness in the population health component of the new National Accounts are not separate from other components of the Accounts.

Similarly, a measure of natural capital like soil quality is directly linked to an economic factor like farm economic viability. If the latter declines, as measured by increasing debt-to-income, expense-to-income, and dependency ratios and declining net farm income and return on investment, then land and soil stewardship may suffer if farmers do not have the means to invest in appropriate conservation measures. These produced/economic and natural capital measures in turn impact social capital, with declines in the former threatening the resilience and vitality of rural communities.

In sum, an effective wellbeing and full-cost accounting reporting framework does not simply include a collection of disparate economic, social, and environmental components, but aims to identify the economic, social, and environmental aspects of *each* component, and to elucidate the linkages among them.

**Cross-component analyses**

As noted above, the potential components of the new National Accounts reporting framework are themselves inter-connected. As well, it is proposed that certain key principles be elucidated *within* each of the framework components. For example, each component has *equity* and *distributional* dimensions. A natural capital component, for example, may include measures of consumption or use by quintile. Thus, it is relevant to measures of forest health (a natural capital component) to consider that the wealthiest 20% of the world's population consumes 80% of the world's paper, while the poorest 20% consumes only 1%, thus adding an equity dimension to the analysis. Similarly, wealthy countries and wealthy households within a country emit more greenhouse gases and generate more waste than low-income countries and households.

Similarly, as appropriate, the *gender* dimension of each component may be highlighted. For example, there are different gender patterns in comparative population health measures, educational attainment, income statistics, paid and unpaid work patterns, and other key measures. Analysis by *age* is a similar key reporting dimension appropriate to most components. For example, a cost of alcohol study might attribute costs by gender, age, income, and other characteristics of alcohol users.

Further research and consultations in the coming months and years in the new National Accounts work may identify similar dimensions that should be included in the analysis of each component of the evolving reporting framework. Along with the distributional, gender and other key dimensions, a cultural dimension might also become more systemically enshrined in the reporting mechanism, so that all key results provide these breakdowns. In fact, each release of a summary annual report, for example, could be accompanied by companion releases of reports that employ such cross-component analysis.

## 4.2 Using the new National Accounts in the policy arena

The new National Accounts will be entirely in line with GNH priorities and based on valuing natural, social, cultural, and human capital, alongside conventional measures of built and financial capital. These tools can provide the economic foundation for an enviable future for Bhutan reflecting the highest shared aspirations, shared goals, and consensus values of its citizens.

Key to the practical application of the new National Accounts is the understanding that measurement and policy are intimately and naturally connected in so far as good and comprehensive evidence is required for informed decision making, and that the new National Accounts therefore have direct policy utility and relevance.

As noted above and as will be discussed in further detail in the section that follows, the various social, economic, and environmental components of the new National Accounts are a reflection of the interdependent nature of reality and are therefore intrinsically linked. Progress or decline in one area will have an impact on other areas, and it is therefore essential to recognize this connectivity from a departmental point of view. For example, tax policies, labour market policies, and early childhood development policies that have been developed with economic or social objectives in mind all have profound health consequences. Similarly, many economic development policies that have been developed with social and economic outcomes in mind may have profound environmental ramifications, which in turn may have further social and health consequences.

In sum, a full-cost accounting based system of National Accounts will reveal that policies developed in the Ministries of Health, Education, Labour, Agriculture, Economic Affairs, and Finance create significant benefits and costs in areas beyond their own immediate jurisdictions. Indeed, the linked components of the new National Accounts are designed precisely to facilitate such understanding and to assist policy makers to look beyond their own areas for the impacts of policies they develop. Thus, the new National Accounts will be an important economic complement to the GNH Index and the GNH screening lens that is applied to potential policies and projects  illustrating the economic valuation and benefit and cost dimensions of the existing indicators and screening tool.

In other words, creating policy that effectively targets the population and pressing issues at hand requires a deep understanding of the complex ways in which causes, conditions, and consequences are related. Similarly, it is necessary to recognize the potential unintended consequences of a policy — beyond the confines of a particular area — to conclude whether it is the right policy to implement in a GNH context. Ideally, all policy would be constructed from this holistic perspective to assess its likely economic, social, and environmental impacts. Our current reality, however, is that governments everywhere are structured by sectors, and that budgets are allocated by ministries and departments. In the present circumstances, therefore, a first step towards more holistic integration of policies will be to use the new National Accounts to track likely outcomes and impacts beyond the sectors in which specific policies are made.

For instance, the Bureau of Law and Order in the Ministry of Home and Cultural Affairs might be interested in working with the *safety and security* component of the new National Accounts, which would document the economic costs of crime in Bhutan, and changes in those costs over time in response to changes in crime rates. However, the new National Accounts will also reference the social consequences — including increases in crime — that might result from a growth in unemployment and inequality, and from an erosion of 'civil society.' For example, data from other jurisdictions reveal that most prison inmates were unemployed at the time of arrest. The new National Accounts will therefore reveal, for example, that a portion of crime costs is also included in the costs of unemployment. From that perspective, the employment, income distribution, and unpaid work components of the new National Accounts respectively are also relevant to the Bureau of Law and Order in so far as policy formation is concerned to prevent crime and reduce its costs to the nation.

Similarly, the Department of Public Health in the Ministry of Health might first study and work with the population health component of the new National Accounts. But policies designed to improve population health should also be informed by the:

- economic components of the new National Accounts where the relationship between income distribution and health, poverty and health, and unemployment and health would be documented; leisure time component of the human capital accounts, which would reveal the health consequences of long work hours, time stress, and loss of leisure time;
- education component of the human capital accounts that documents the close relationship between literacy and health, and which ideally will also document levels of health literacy and food and nutrition literacy;
- air quality section of the natural capital accounts that will document the health costs of pollution; and so on.

In sum, crime costs and health costs, to take these two examples, are outcomes that flow from a wide range of social, economic, and environmental causes and conditions. To craft informed policy that effectively targets the causes and conditions of crime and health and that seeks to reduce their current costs to society therefore requires a broad and holistic understanding of the new National Accounts. A full-cost accounting system that accounts for the value of natural, human, social, cultural, and produced capital will, by its nature, help facilitate the formulation of public policy that factors in a wide range of possible influences and consequences of each policy.

These connections and relationships — for example between income and health, poverty and health, unemployment and health, economic development and environmental health, environmental health and human health, to name but a few — are already well documented in the literature and can be easily accessed online. Also, much of this background evidence has been conveniently summarized in the literature reviews that constitute part of full-cost accounting studies. This ready availability of global evidence will certainly facilitate both the construction of Bhutan's new National Accounts and their use by policy makers not only for the immediate results the produce but also for important evidence on the linkages between their component parts.

To illustrate this key point with one important example, we note that much work has been done on the "social determinants of health" — which include, in part, income and income distribution, education, unemployment and job security, employment and working conditions, early childhood development, food insecurity, housing, social exclusion, and social safety networks. Thus, the World Health Organization and other leading institutions and researchers have explicitly recognized that living conditions affect health more than life style or medical treatments.[34] In its *Chronic Disease Prevention Strategy,* one Canadian provincial department of health promotion explicitly acknowledged these connections, and pointed to the need for government departments to work in tandem to implement complementary strategies:

> Many of the significant factors that impact chronic disease prevention are beyond the scope of one government department, or the health sector in general. In terms of

> public policy, government health departments are unable to address many issues related to the determinants of health (e.g. issues related to income or unemployment) because health departments do not have the authority to enact policies that directly affect these issues. Examples of non-health sector interventions that have health implications are policies about transportation, education and income taxes.[35]

The Strategy goes on to point out that health is linked to "social circumstances and poverty" and that "addressing chronic disease risk factors will require a concerted effort to decrease health inequalities."[36]

Similarly, that province's director of addiction services at the time bemoaned how difficult it was to put in place an effective and comprehensive tobacco control strategy without getting the finance, tourism, education, police and other departments around the table, since they were all needed for critical elements of the proposed strategy — including raising tobacco taxes, creating smoke-free places legislation, implementing school-based smoking prevention programs, and enforcement of new regulations. So long as these departments regarded tobacco control as the jurisdiction of the health department and none of their own business, a comprehensive tobacco control strategy was correspondingly difficult to craft and implement. This pressing need for inter-departmental collaboration in policy formation and implementation can be greatly (and naturally) facilitated by the full-cost accounting mechanisms of the new National Accounts.

Ideally, and in the longer term, use of the new National Accounts in a holistic way will lead to an enhanced recognition at the departmental level that many departmental objectives and outcomes are held in common, and that a transfer of ideas and ongoing cooperation between departments are therefore needed so that these relationships and connections are well understood and so that they inform decision making in all major government initiatives. In the even longer term, and as this understanding deepens, the very structure of government and allocation of budgets could possibly change to a more holistic, inter-sectoral model. In all these ways, the new National Accounts will strongly support the inherently holistic GNH approach to development,

To appreciate the importance of this contribution, it is only necessary to recall how the present narrow GDP-based accounts, which ignore social and environmental realities, so frequently send messages to policy makers that undermine and are contrary to GNH-based development and that reinforce the departmental "silo" approach to policy making that is prevalent globally. Because Bhutan already has a philosophy and development approach that are holistic in nature, as eloquently expressed in the title of Bhutan's first UN resolution (65/309) of 19 July, 2011 — "Happiness: Towards a holistic approach to development" — this country is ideally suited to be the first in the world to create a holistic and integrated set of National Accounts as the foundation of a true GNH economy.

## 4.3 Policy implications of valuing true wealth

The new National Accounts can draw on the best available evidence and literature to present practical policy-relevant recommendations that integrate social, economic, and

environmental objectives. Thus, any government department will be able to use the new National Accounts to derive comprehensive sets of policy recommendations, which will naturally flow from the evidence and findings of full-cost accounting reports. The accounting component of the full-cost accounting work will also enable a focus on the cost-effectiveness of these recommendations. For example, the Accounts will be able to provide specific recommendations with cost implications on improving population health and enhancing economic and financial security, on forest and waste management, farmland preservation, energy conservation, sustainable transportation, and more.

While this summary prospectus cannot adequately describe and explain those evidence-based policy considerations, especially since the full-cost accounting results are not yet available, the section below attempts to give a few examples of the type of policy-relevant evidence policy makers might find in some of the components of the new National Accounts. These few examples at least illustrate their relevance to the overall measures of true wealth, show how they can be valued in this new accounting system and how the various components interconnect, and point to the kinds of policy implications that flow from these realities and relationships.

Due to space considerations, key data sets that might make up each component have not been listed or discussed in any detail in this section, which simply notes a small selection of potential policy implications of the new Accounts for illustrative purposes. Chapter 5 of this prospectus includes more detail on select components, including example data sources and methods used to estimate these and other results.

## ECONOMIC VALUATIONS OF TIME

While GDP only accounts for the value of paid work and monetary exchanges, the new National Accounts will account for all productive labour — both paid and unpaid — and also for the value of leisure time. GDP perversely values the replacement of voluntary work, leisure time, and unpaid child care by paid work as economic gain and therefore as a contribution to prosperity and wellbeing, regardless of the detrimental effect of those losses of unpaid work and free time on quality of life, community vitality, child-rearing, and other dimensions of wellbeing.

By contrast, the new National Accounts recognize that all time has value, and they will assign economic value to all aspects of a person's waking day — civic and voluntary work, unpaid household work, leisure time, and paid work. All four of these dimensions of time use valuation are briefly considered here as key components of the new National Accounts. While they are considered together here as different dimensions of the valuation of time, they will be grouped as follows in the capital domains of the new National Accounts:

- Valuations of paid work and unpaid household work are two dimensions of produced capital.
- Valuing civic and voluntary work is a key component of social capital.
- Valuations of leisure time are part of human capital.

### Civic and voluntary work

A widespread, independent, and active network of community and voluntary organizations is widely regarded as a hallmark of "civil society" and a critical indicator of healthy democracy. This "social economy" is the arena in which we participate most fully as citizens, freely choosing our interests and associations, and expressing our deepest aspirations to help others. The strength of a society's commitment to voluntary work is, for many social scientists, a touchstone of social health, stability, and harmony, and thus a key indicator of social and community wellbeing. Analysts have observed that a weak civil society, by contrast, is more subject to social unrest, alienation, and disintegration. It is frequently associated with higher rates of crime, drug abuse, and other dysfunctional activities, which eventually produce much greater social and economic costs than wise investment in the community and voluntary associations that strengthen the fabric of civil society.

According to the World Health Organization, social support networks, which extend from close family and friends to voluntary associations in the broader community, have been found to be major determinants of health.[37] Social support networks can be seen in the voluntary work that people do in organizations and in the informal help through which they share resources and build relationships with others. For this reason, volunteerism is a key indicator of a supportive social environment and of the strength and safety of communities.

As previously noted, because no money is exchanged, the value of volunteerism is nowhere to be seen in economic growth statistics and related measures of 'progress.' However, volunteers represent a substantial stock of social capital, and their services represent the flow of this capital — both are highly valuable to the state of the economy and social wellbeing of the nation. If the services provided by volunteers had to be replaced for pay, the costs would be enormous — even if the replacement cost of voluntary work did not include the hidden social and economic costs associated with a decline in "civil society." A study of the basic value of voluntary work in Bhutan, using data from the 2010 GNH Survey, is being released in February 2012 alongside this prospectus.

In the future, when time series data have been accumulated, it will be possible to determine whether volunteer hours nationwide are increasing or declining and hence whether the economic contribution of volunteerism to Bhutanese society is rising or falling. If the latter is the case, and if this social wealth is being eroded, then strategic investments to encourage civil society formation and activity might be undertaken.

Easing the formation of civil society organizations in Bhutan by reducing the very lengthy and bureaucratic present procedures would already constitute a major policy step to encourage volunteerism and thereby to increase the economic value of voluntary work to Bhutan. It should be recalled that services provided by volunteers in serving communities and creating social benefit directly and literally save government money, since government may otherwise need to provide those services for pay to maintain living standards and quality of life. In these ways, the economic valuations of unpaid work in the new National Accounts will likely support policies that strengthen the voluntary sector.

**Unpaid housework and childcare**

Every day, and for no pay, Bhutanese citizens perform hours of valuable services in their

own homes that contribute directly to wellbeing and economic prosperity. In fact, it has been argued that the work performed in households is more essential to basic survival, social wellbeing, and human happiness than much of the work done in offices, factories, and shops, and is a fundamental precondition for a healthy market sector. If children are not reared with attention and care and if household members are not provided with nutritious sustenance, for example, workplace productivity will decline and social costs will rise. Yet, because these services — from raising children to running a household — are assigned no monetary value, their massive contribution to society does not show up in standard measures of economic progress.

It is noteworthy that Simon Kuznets, Nobel Prize-winning economist and one of the chief architects of national income accounting, argued half a century ago that unpaid household work should be included in GDP estimates, since it reflects actual production and since its valuation is essential in order not to mistake production shifts from the unpaid household sector to the paid market sector as 'growth' (as happens today). Kuznets felt so strongly about this that he actually broke with the U.S. Commerce Department largely over the department's failure to value unpaid household work.

The implications of not valuing unpaid household work are especially deleterious to women's position in society, since it is they who perform the bulk of this unpaid work. For example, unpaid workers are generally excluded from pension plans and can have trouble getting credit. In addition, women who take time from careers to raise children can lose seniority or opportunities for promotion, as well as the ability to make workplace pension contributions. Failure to value women's unpaid work can also produce a subtle "wage discrimination" by devaluing women's work as a whole. Work considered traditional, unpaid female work — childcare, cleaning, cooking, and other 'domestic labour' for example — also fetches very low wages in the market economy.

Failure to value unpaid childcare and housework also results in a lack of adequate social support, especially in urban areas, that largely penalizes lone-parent mothers, who — at least in industrialized societies — often carry the total burden of unpaid household work alone. In Canada, when they also hold down paid jobs, single mothers spend three times as high a proportion of their incomes on paid childcare as their married counterparts and frequently suffer extreme levels of time stress and "time poverty" that give them considerably less dedicated time with their own children than their married counterparts.[38] For many of these women, the paid workforce is not a viable route to an adequate income that also leaves them time to raise their children properly and undertake essential household tasks. Yet the lack of adequate social support for unpaid workers often gives them little choice.

In Bhutan, families and relatives still provide more of a cushion and social safety net for single mothers than in most western societies. But the trends described above may become a developing problem in Bhutan, especially in urban areas. Valuing unpaid household work and childcare in the new National Accounts will at least bring these issues to the surface and make them visible, and encourage policy support for single mothers and generally for those whose primary productive work is in the home.

Measuring unpaid work is also essential to overcoming gender discrimination through under-valuation of women's economic and social contribution. Statistics Canada notes: "Since

women do most of the unpaid household and volunteer work, their significant contribution to overall production and economic welfare is grossly understated in the major economic aggregates."[39]

In general, data on unpaid work, combined with information on paid work, are also important to provide a more complete picture of the work activities of all Bhutanese citizens, and particularly of their efforts to juggle their employment and family responsibilities and to achieve a satisfactory work-life balance. Such balance, in turn, is a vital ingredient in physical and mental health, wellbeing, and happiness.

For these reasons, recognizing and valuing unpaid work will encourage policies that address low income and high time-poverty rates among single mothers and their children; the decreasing time many parents have to spend with their children; and the growing time stress attributable to the "struggle to juggle" paid jobs with household duties. In urban areas of Bhutan particularly, commentators are already pointing to social problems arising from a decline in quality time spent by parents with their children. Valuing unpaid household work and childcare explicitly in the National Accounts, as core dimensions of economically valuable productive labour, can help expand appreciation for these presently "unvalued" activities that are invisible in the conventional GDP-based economic accounts.

The most straightforward method by which the new National Accounts can estimate the contribution of unpaid household work and childcare to the national economy is by multiplying the CBS GNH survey time use data on hours of unpaid household work per year by the average hourly rate paid to domestic and childcare workers in Bhutan. This would yield a basic market economy replacement cost valuation for this unpaid household work. Other valuation methods exist, including opportunity cost valuations and output estimates, but the replacement cost methodology described above is the simplest, and can easily be done using readily existing and easily available data sources.

**Leisure time**

Free time is one of the most basic conditions of wellbeing and happiness. Without it, people have no time to relax with family, children and friends, to appreciate nature, to pursue hobbies and interests, to practice religious activities, to reflect and read, to engage in sports and physical activities that are so essential to good health, and simply to enjoy life. Even more fundamentally, free time is the only time we have to do what we want, not what we have to do, and it thus constitutes a key condition for freedom. Nearly 2,500 years ago, Aristotle, in the *Politics*, described leisure as a prerequisite for democracy and citizenship, as it allowed time for contemplation and debate of vital state issues.[40]

Social scientists and psychologists have further recognized that leisure also has significant value in buffering life's stressful events and assisting individuals in coping with stress. Taking care of basic needs (like washing, sleeping, cooking, eating, shopping, and cleaning), taking care of family and others, working for pay, and education all make demands on time and require attention and effort — frequently not at one's time of choice. Many such tasks are relentlessly repetitive, frequently tax individuals' mental and physical resources, and often generate stress while trying to accomplish diverse tasks and demands.

A study published by the *American Journal of Health Promotion* found stress to be the costliest of all avoidable health risk factors,[41] and Statistics Canada found long work hours to be correlated with higher rates of smoking, physical inactivity, unhealthy weight gain, and depression.[42] Conversely, leisure has been found to ameliorate the stresses of work and daily life, and to have positive value and benefit for both physical and mental health.[43] And it is widely accepted that when free time gets squeezed out, the quality of life suffers. In a country like Bhutan, we might argue — inheritor of more than millennium of ancient wisdom traditions passed down in unbroken lineage — the importance of free time is accentuated as the precondition for the study, contemplation, meditation, and practice of those profound teachings.

Leisure time, in short, has ***value*** — value that is invisible in the conventional GDP-based accounts. In fact, the more paid work squeezes out free time, the more GDP grows and the more we perversely celebrate our "growth," "progress," and "prosperity." In the accounting language of the new National Accounts, by contrast, leisure time is regarded as a human capital stock that can be valued in both its quantity and quality, and that is also subject to depreciation if it is squeezed out by excessive work and other required tasks. While conventional analyses describe human capital only in terms of skills that enhance workplace productivity, full-cost accounting methods consider the full 24-hour use of time — including paid work, unpaid household work, voluntary work, personal tasks, study, and free time, and the balance between these activities — as a contribution to human wellbeing.

In sharp contrast to economic theories that see growth as limitless, the full-cost accounting approach sees a person's time — like the world's natural capital — as limited, and so wellbeing and happiness, both in this and future generations, depends on *how* that limited time is spent and how skillfully and sustainably those finite natural resources are used. Each person has a finite life span and only 24 hours in a day to allocate to activities both required and chosen.

In sharp contrast to GDP, which values only paid work, the new National Accounts therefore will report time allocation far more comprehensively, and value unpaid work and free time alongside paid work. When we try to account for genuine wellbeing, leisure time lost or gained must register in the books. Leisure time lost will register as a cost in the National Accounts. To estimate the monetary value of such a loss of free time on an annual basis, one rather arbitrary but common method of valuation is simply to value hourly leisure time at half the hourly average wage. Conversely, if the CBS GNH Survey time use data show that the Bhutanese populace has adequate or growing leisure time for wellbeing and happiness, then this leisure time will also be estimated in monetary terms and counted as contributing to the wealth of social and cultural capital.

Global evidence clearly show that the massive productivity gains of the last half century have not translated into increased leisure time. On the contrary, countries like the USA have seen paid work hours lengthen, and women globally have seen a significant loss of leisure time as they increasingly struggle to balance both paid and unpaid work responsibilities. Statistics Canada's time use surveys found that full-time working single mothers put in an ***average*** 75-hour work week when both paid and unpaid work are counted. In dual earner urban families in Bhutan, one now increasingly hears complaints of overwork and lack of free time. Are these the markers of improved "prosperity", wellbeing, and a GNH society?

In recent (November 2011) talks to about a thousand Samdrup Jongkhar villagers, Dzongsar Jamyang Khyentse Rinpoche addressed this issue directly. His remarks are quoted at length here because they express in simple, straightforward, and colloquial terms precisely the issue raised in this section, and the contrast between the current, materialist GDP-based approach to wealth and the necessity for valuing free time as an essential dimension of wealth, as the new National Accounts will do. He said:

> Being wealthy and being materially rich are two totally different things. By wealthy I mean to be able to lead content lives, to be content with whatever we have. And it means having time to have fun. It's when you have time to play archery, when you have time to play khuru. Wealthy is when you can lay back and sing songs. It's not when you have millions and billions of money in your bank account but don't even have time to sleep properly in the nights because of work. Someone who does not even have time to eat his or her dinner properly because of multiple business deals being made over the mobile phone is not a wealthy person. So please remember the difference between wealthy with money and wealthy with contentment….
>
> Now let's look at family situations in cities like Thimphu. There we have the father working to support the family, but we also have the mother working, because extra income is needed since the house rents are so high. They also need to keep the bank accounts in balance. There is also a sense of competitiveness, so if your neighbour buys a Maruti car, you would have to buy a Mahendra — just to feed our own ego, and to feel secure that your car is better than the neighbours.
>
> Even when it comes to raising children, people living in the Thimphus and Phuentsholings of the world have no time for that. Everyone is just too busy trying to keep up with the others, trying to make that extra money. So children are growing up with no proper parental advice.
>
> I still remember how it used to be 40 or 50 years ago in Bhutan. Every mealtime, the whole family would get together and sit in a big circle. The father, mother and children would all gather and have family meals together. There were no televisions, and everyone would sit together and enjoy their meals together. They would talk, laugh, and drink wine and sometimes even fight during meal times. Now in Thimphu, during meal times, we have one son watching TV in his room, we have the daughter watching TV in her room, and the parents are still not home from work.
>
> These situations are all what we call the sufferings of modern famine. People are suffering like this because they are wealthy or trying to get wealthy. For me, this is not true wealth…. If we have material wealth with the aim of being happy, but we have the family structure all falling apart, then that's not happiness. So what is the true meaning of wealth? …Wealth is to be content with what we have.

Policies designed to address this issue of shrinking leisure time will inevitably need to delve into work time reduction options, which will in turn raise equity issues. Leisure time is a basic right of all workers. Yet many low-wage workers, especially in urban centres like

Thimphu where rents are high, currently work two jobs to make ends meet. To this end, minimum and low wage levels will need to be re-examined to ensure they are sufficient to provide a living wage, so that workers currently working excess hours to afford basic necessities for their families can choose to reduce their hours and enjoy at least some leisure time with family and friends and in recreation.

If low wages, inadequate minimum wages, and sharp income inequality are present, then the working poor will not likely choose a reduction in work hours. Instead, they will likely retain their long hours or increase them further in order to make ends meet. For those with financial resources, a reduction in work hours and enjoyment of more leisure time would seem to be more feasible, but they too often take on excess financial obligations (such as expensive car and house payments) that keep them locked into a work-and-spend cycle at the expense of free time. In sum, trading excess work for leisure involves both equity issues in cases where low-wage workers put in long hours to pay for necessities, and fundamental psychological choices and priorities of the kind Rinpoche addresses above.

Lest policy choices on this issue seem daunting and out of reach, it must be noted there are excellent and inspiring models of successful work-time reduction initiatives throughout the world. The Netherlands successfully reduced its unemployment rate from 12.2% in the early 1980s to less than 3% in 2001 partly through work-time reduction measures that spread the available work more widely. In particular, part-time workers in the Netherlands get equal hourly pay, pro-rated benefits, and equal opportunities for career advancement as full-time workers. Making part-time work more attractive in these ways has resulted in the Netherlands having the highest rate of part-time work and the lowest average hours of work of any industrialized country.

The Netherlands also has one of the highest rates of worker productivity because workers generally perform better when they work shorter hours, and workers now have more time to spend with families and serve their communities through voluntary work. Germany avoided many of the massive layoffs that accompanied the 2008-09 economic collapse largely by reducing work hours and sharing the available work more equitably. In short, there are many excellent and successful models of work-time reduction that can inspire policy makers to take effective action to expand leisure time and thereby improve wellbeing and quality of life. Once the value of leisure time is properly and fully valued in the National Accounts, this will become a greater policy priority than at present.

**Paid work hours / employment**

Paid work fulfills crucial functions for people, even beyond its main role of providing income and sustenance. According to a seminal study by Marie Jahoda, work literally "shapes the experience of the employed"— by imposing a time structure, by enlarging the circle of the individual beyond his or her family, by allowing the worker to participate in a collective purpose or effort, and by assigning the individual with a status or identity.[44]

According to Jahoda, the absence of these functions due to job loss can have "destructive" psychological consequences, particularly since existing social norms allow very few of the unemployed to establish their own substitutes for these functions outside of paid

employment. In the end, analysts have noted that the jobless suffer "impoverishment of social experience," which can ultimately lead to mental and physical illness, family breakdown, crime, and loss of human potential.[45]

In sum, paid work can contribute greatly to security and wellbeing not only through provision of basic income, but through myriad social and psychological functions. Conversely, both job loss and overwork can substantially diminish wellbeing.
In the economic growth statistics conventionally used to measure progress, long work hours, work-related stress, and the cost of treating stress-induced illness are *ipso facto* treated as contributions to "prosperity," since every additional paid work hour and every expenditure on Prozac and other drugs and sickness treatment costs makes GDP grow. These ills are indirectly counted as contributions to "social progress" because they translate into increased output, income, and consumption of goods and services.

But there are economic, social, and environmental costs associated both with increased output and with long work hours. Longer work hours may exacerbate stress, produce adverse health outcomes, reduce time with family and friends, and diminish our happiness, while increased output may place excess demands on our natural resources.

At the same time, unemployment and underemployment waste precious human resources and also produce substantial social, human, health, and economic costs. The full costs of these and other dimensions of work-time and of the nature of modern work are not captured in our current GDP-based measures of progress, which therefore send misleading messages to policy makers.

Unemployment, for instance, has been associated with stress, poverty, financial insecurity, poor health outcomes, and a wide range of social problems, including alcohol and drug addictions, and violence. Abundant evidence indicates that the unemployed generally suffer higher rates of physical and mental illness than those with jobs. In fact, both unemployment and overwork carry health problems and hidden costs, and one Japanese study found that the underemployed and overworked had equally elevated risks of heart attack.[46]
Unemployment is also associated with crime.

When the new National Accounts include the cost of crime in assessments, it will be possible to correlate that evidence with that on employment to determine how many prison inmates were unemployed at the time of admission to the correctional facility. In short, when assessments of livelihood security are linked to other components of the new National Accounts like population health and community safety, the negative social consequences of unemployment and layoffs are seen far more clearly than conventional economic analyses are able to show.

Unlike the unpaid civic, voluntary, and household work and leisure time described above, which are invisible in conventional GDP-based measures, paid work *is* currently measured in GDP and in the conventional accounts as a core input to market-based production and output. The new National Accounts will clearly continue to value the contribution of paid work as part of produced capital, but they will not blindly assume — as the present measures do — that more hours necessarily contribute to wellbeing or signify an increase in value. Because the new National Accounts produce ***net*** valuations that ***balance*** economic, social,

human, and ecological valuations, they will also clearly display the costs of both overwork and unemployment alongside the benefits of paid employment.

## PRODUCED CAPITAL

In addition to the valuation of paid work hours and associated costs of overwork and unemployment discussed above, this section examines three other inputs into produced capital that are inadequately accounted for in the existing conventional national accounts. Thus, while GDP assesses total national income, it does not account for changes in its distribution. Thus GDP per capita may increase while poverty and income inequality grow. Further, as a "gross" accounting system, GDP does not account for the proportion of consumption growth attributable to debt.

Here we therefore consider key equity, distributional, and security aspects associated with income and produced capital that are not properly accounted for in GDP-based and conventional accounting mechanisms — namely income distribution, financial security (personal assets, liabilities, and wealth), and economic security, which refers to the "social safety net" that protects individuals in cases of job loss, sickness, old age, single parenthood and other circumstances that may adversely affect income and livelihood.

In this introductory prospectus, we do not address the business and public infrastructure that are currently accounted for in the existing balance sheets. But even in these presently accounted-for areas, it should be noted that the new National Accounts will make significant improvements by accounting for factors like durability that are presently not properly considered in the conventional accounts. Just as a side note here, it should be observed that the quicker capital items wear out, and the more rapidly they must be replaced, the more GDP grows, since GDP values gross production. A more accurate net accounting system will value the durability of capital items rather than their replacement, and it will also account for the ecological costs of waste generation and disposal.

Nevertheless, time and space do not permit exploration of these key dimensions of produced capital here, or of improvements that Bhutan's new National Accounts will institute in these net produced capital valuations. Here we confine ourselves just to the following three issues.

### Income distribution

Income and its distribution are widely acknowledged as core and basic measures of wellbeing. Abundant evidence links poverty with physical deprivation, illness, crime, poor educational attainment, low productivity, stress, and other detriments to wellbeing. Income inequality also affects societal wellbeing and cohesiveness more broadly.

For example, poverty and inequality are among the most reliable predictors of poor health. The World Health Organization (WHO) states that people who are poor run at least twice

the risk of serious illness and premature death when compared to those with higher incomes.[47] Low socioeconomic status has been identified in epidemiological studies as a precursor to cancer, cardiovascular disease, arthritis and musculoskeletal disorders, diabetes mellitus, dental diseases, drug dependence and abuse, and infant mortality and morbidity.

Child poverty has also been reliably linked to a wide array of physical, psychological, emotional, and behavioural problems among children, including higher rates of respiratory illnesses and infections, sudden infant death syndrome, obesity, high blood lead levels, iron deficiency anaemia, chronic ear infections, mental retardation, fetal alcohol syndrome, and dental problems.[48] Low-income children are more likely to consume less nutritious foods, and to have low birth weights, poor health, higher rates of hyperactivity, delayed vocabulary development, and poorer employment prospects.

However, a growing body of evidence indicates that not only poverty, but also the *distribution* of income — the gap between rich and poor and the extent of income inequality — has important consequences for health. For example, higher income inequality has been correlated with higher rates of mortality, lower self-rated health, and greater prevalence of obesity. According to the *British Medical Journal*:

> What matters in determining mortality and health in a society is less the overall wealth of the society and more how evenly wealth is distributed. The more evenly wealth is distributed, the better the health of that society.[49]

And a November 2007 analysis in the *British Medical Journal*, concluded that: "Improvements in child wellbeing in rich societies may depend more on reductions in inequality than on further economic growth."[50]

A growing body of evidence links improvements in equity with positive economic, social, health, environmental, and political impacts. This basic understanding is backed by a growing body of research demonstrating, that greater income equality can enhance productivity and economic health, while sharp wealth and income inequalities can threaten social stability and cohesion and undermine productivity and health.[51]

There are two key reasons why income distribution may affect health. Socio-psychological research suggests that individuals at the bottom of the income ladder may feel greater "anxiety and shame" about their lot in comparison with those better off. Over time, this negative emotion can lead to chronic stress, which in turn can lead to adverse physical health outcomes. The second key reason, based on what is called the neo-material approach, suggests that the poor suffer adverse health effects from not having access to the same resources or living conditions — such as health care, nutritious food, housing, secure employment, and a sense of social belonging — as those with higher incomes.[52]

Despite the proven importance of income distribution and low income in affecting health, productivity, educational attainment, social cohesion, economic performance, and other determinants of personal and societal wellbeing, GDP-based measures of progress report only total and average income, but tell us nothing about how that income is shared. Indeed, GDP growth statistics and GDP per capita averages can be deceptive markers of wellbeing,

since an increase in income among the wealthy can skew the averages up, even if most people are getting poorer and if inequality is growing.

A full-cost accounting, by contrast, includes income distribution — the income gap between rich and poor — in its valuations through at least two well-accepted measures. First, the Gini Coefficient, widely used globally including by the World Bank, measures income inequality throughout the income scale. However, it is also important to assess gaps between the richest and poorest quintiles (20%) or deciles (10%). For the latter, the disposable income (after taxes and transfers) of the lowest-income levels is expressed as a ratio in relation to the highest income levels. The concentration of economic vulnerability among certain groups like single mothers, youth, and the unemployed, and regional income gaps (between rich and poor in urban and rural areas) can also be discerned through such measures.

Including measures of income distribution in the core National Accounts will naturally raise the policy profile of equity issues. First GDP and average income statistics would never again be reported without also reporting at the same time how that income is shared, and every instance of GDP growth would be accompanied by clear reporting of who the key beneficiaries of that growth have been during the previous period. That will lead to much more informed policy making. For example, policies dealing with taxation, minimum wage, social assistance, child benefits, health promotion and more can all be informed by income distribution measures, with the understanding that improvements in equity will enhance both societal and human wellbeing.

**Financial security: Personal assets, liabilities, and wealth**

Wealth is defined as assets minus debts. Wealth adequacy, wealth disparities, and the ability of individuals to manage and service their debts are three key measures of financial security, which in turn is a significant contributor to wellbeing, as indicated by the examples that follow.

Adequate wealth and savings can enhance financial security by enabling households to weather the financial crises that can result from job loss, sickness, death or disability of an income earning partner, or other unexpected circumstances. Adequate wealth and savings can also provide a reserve for home repairs, farm equipment replacement or other purchases that are suddenly required, or for educational needs or any unanticipated financial outlays that would strain normal income. Conversely, the inability to manage debt can seriously compromise financial security and wellbeing and cause a range of other problems including stress, anxiety, illness, and (in extreme cases) even crime and suicide. The sub-prime mortgage crisis in the U.S. illustrates clearly that widespread inability to manage debt can also send massive shockwaves through the economy as a whole.

For example, the 2008-09 financial crisis in the West, which sent these shock waves around the globe and from which the world has not recovered, was triggered in 2006–2007 by high default rates on U.S. sub-prime mortgages that in turn were an outcome of increasingly risky lending and borrowing practices in preceding years. In addition, individual and corporate debt levels had reached record high levels. The increase in housing default and foreclosure activity in the U.S. — up nearly 80% between 2006 and 2007 — eventually triggered the

collapse of the asset backed market in that country.

Bhutan's new National Accounts will carefully monitor household debt to ensure that it is not rising at a considerably faster pace than income or assets, which would leave many Bhutanese in an increasingly vulnerable financial position and compromise their capacity to service and manage their debts. The new Accounts will therefore send early warning signals to policy makers about potential impending financial difficulties and enable timely remedial action like tighter lending policies before widespread defaults lead to a systemic crisis in the economy at large.

The failure of conventional accounting mechanisms and 'gross' income measures to send such warning signals in the U.S. in 2006-08 signified the real bankruptcy of the conventional growth-based economic paradigm that was only concerned to see *more* economic activity, regardless of whether such activity was debt-fuelled and in excess of capacity to pay. While full-cost accounting mechanisms frequently emphasize the importance of figuring environmental and social benefits and costs into the accounting equation, it is important to realize that — even in straight economic terms alone — the existing system is fatally flawed, incapable of sending accurate signals to policy makers, and urgently in need of replacement by a more comprehensive set of accounts.

Through their better reporting, Bhutan's new National Accounts will naturally point to policies that can effectively address trends in increasing household debt, including:

- more effective regulation of the financial sector,
- establishing firmer criteria for responsible lending,
- reducing over-indebtedness especially among the poor by creating interest rate ceilings, and
- advising and educating households on budget management.

The new National Accounts will also carefully and regularly track changes in wealth distribution to ensure that the benefits of development are not accruing only to a small sector of the population. In that regard, policy makers will also want to address any growth in wealth inequity and may take steps to ensure a guaranteed living income for those without means, so that financial security does not become the preserve of those who already have adequate wealth.

**Economic security**

Economic security means that individuals have a sense of confidence, protection, and even certainty about their economic safety both in the short term and for the foreseeable future. The economically secure do not worry about finding adequate economic resources to support themselves and their families, especially when encountering the economic losses that may result from being unemployed, ill, separating from an income-earning partner, or growing old. Thus, they do not feel overly anxious about potentially adverse circumstances that they may encounter in the future, and they have confidence that existing social mechanisms will provide adequate protection against such circumstances and conditions.

Since individuals' anxieties and perceptions of potential economic insecurity in the future

adversely affect their present feelings of wellbeing, economic security is an important component in the measurement of individuals' wellbeing. and could be an important key indicator in the new National Accounts. Using data from GNH Survey questions about Bhutanese citizens' sense of financial security and their economic hardships along with aggregate economic security indices, Bhutan's new National Accounts will be able to provide assessments on whether economic security is growing or declining nationwide, by region, and in rural-urban comparisons.

Various economic security indices are available that can serve as models for Bhutan's new economic security accounts, including the aggregate Index of Economic Well-being developed by Lars Osberg and Andrew Sharpe, which is based on security from the economic risks imposed by four key factors — unemployment, illness, old age, and single parenthood.[53] That index can be adapted and expanded to include other risk factors particular to Bhutan, as indicated by the GNH survey data.

Since a key determining factor for economic security is the 'social safety net,' policy makers will be able to use the new National Accounts data in this area to craft policies that strengthen the social safety net by providing benefits to those most at risk. Such policies might include ensuring minimum wage adequacy, and providing benefits for social assistance, child-rearing, and unemployment insurance.

## HUMAN AND SOCIAL CAPITAL

Here we briefly describe two examples of human capital — population health and an educated populace (in addition to the leisure time example provided in the time valuation section above) — and one more example of social capital — safe and secure communities (in addition to the voluntary work example provided in the time valuation section above.)

Excellent advances have been made in the last 20 years in economic valuations of population health, particularly in sophisticated studies of illness costs and the economic burden of particular risk factors like smoking, obesity, and physical inactivity. In recent years this this work has been expanding into the realm of socio-economic health determinants, with studies now available on health costs attributable to poverty and to income and educational disparities. All those studies are based on well-defined and — in many cases — universally agreed indicators, which now have time series data available.
The same is true of valuations of community safety and security, where well-developed models exist of crime cost valuations — based on robust and well agreed indicator sets and available time series — that at least allow assessments of "depreciation" in community safety and security. There is therefore no obstacle to Bhutan`s new National Accounts rapidly developing first-rate economic valuations of key health risk factors and crime costs and using those data to assess cost-effective interventions designed to improve population health and community safety. In these ways, key dimensions of human and social capital can quickly be brought into Bhutan's new National Accounts, along with voluntary work and leisure time valuations discussed above.

In very sharp contrast, the second key dimension of human capital discussed below — educated populace — is (ironically) one of the most primitive and backward dimensions of

measurement, with not even agreed indicators on what constitutes an educated populace, let alone survey instruments, data sets, and time series to track trends. Without that indicator base, as noted above, economic valuations are not even possible. As indicated below, this area therefore first requires development of accepted indicators and a new Knowledge Survey to collect the basic data that will be required for subsequent economic valuations. In sum, we are still a long way from incorporation of monetized education accounts in the National Accounts, but we do at least know (and recommend below) the immediate first steps required to begin to move in that direction.

**Population health**

Health is the outcome of a wide range of social, economic, and environmental factors. In a very real sense, all the components of the new National Accounts can therefore be seen as constituting, in effect, the social, economic, and environmental determinants of health.

Therefore, the population health component of the new National Accounts must be seen in the context of all the other components. Indeed, as noted, one of the key purposes of the new National Accounts is to demonstrate the close linkages and relationships among the social, economic, and environmental determinants of health, happiness, and wellbeing. In other words, the entire new National Accounts are quite literally about health, since the other potential components — on income and its distribution, work hours, employment, financial security, education, crime, free time, air quality, water quality, energy, greenhouse gas emissions, transportation, and more — *all* constitute determinants of health. This statement is not rhetorical, but is entirely based in hard evidence.

Full-cost accounting assessments of population health components and disease risk factors often include economic cost estimates for hospitalization, physicians, drugs, and other direct health care costs; productivity losses due to disability and premature death; and other costs associated with illness or injury related to unemployment, work stress, crime, accidents, air and water pollution, and other health determinants. As well, other components of the new National Accounts will also reference health impacts. For example:

- the income component of the new Accounts will describe the health impacts of poverty and inequality;
- the debt and financial security component will reference evidence that inability to manage debt has been associated with illness and even suicide;
- the economic security component will include a detailed assessment of the economic risks associated with illness;
- the educated populace component references health literacy as a key attribute of an educated populace, documents the epidemiological evidence relating higher levels of literacy to better health, and estimates the health costs attributable to educational inequalities;
- the air quality component will document health costs attributable to pollution; and so on.

In other words, health impacts and their economic benefits and costs are integrated into many components of the new National Accounts.

Population health accounts also often include full-cost accounts of the costs of various

preventable chronic diseases and preventable risk factors such as tobacco use, alcohol misuse, obesity, and physical inactivity. These accounts estimate the amount and proportion of direct taxpayer-funded health care costs can be attributed to these chronic diseases and preventable risk factors, and then the amount of money a jurisdiction could possibly save if these risk factors were reduced in the populace.

Such population health accounts have had direct policy effects in jurisdictions that have created strategies for reducing risk factors and addressing the behavioural and socioeconomic determinants of health. In Nova Scotia, Canada, for example, with a population of just 940,000, the government created a new Department of Health Promotion with its own budget and minister in direct response to evidence that it could save $500 million a year if the population did not smoke, had healthy weights, and exercised regularly.

While it would be naïve to draw simplistic cause-effect inferences between particular health determinants and particular health outcomes, the overwhelming weight of evidence clearly indicates that wise investments in natural, human, economic, and social capital, and concomitant improvements in economic and financial security, environmental quality, education, safety, community wellbeing, and work-life balance, can all improve population health outcomes.

By valuing natural, human, social, and produced capital explicitly, Bhutan's new National Accounts will provide the necessary data and information for policy makers to initiate cost-effective interventions in these fields to improve population health and save money in avoided health care costs. In sum, the existing evidence clearly shows that investments that reduce preventable chronic diseases and risk behaviours will produce a very substantial rate of return and long-term benefits in lives saved, better long-term health outcomes, and significant cost savings.

**Safety and security**

A peaceful, harmonious, and secure society is an important social asset and makes a vital contribution to our happiness. Public opinion surveys consistently report that physical security is a top priority for citizens.[54] In addition, physical safety and security have been acknowledged as key non-medical determinants of health, and crime rates are often included among health indicators.

In our conventional economic accounts, however, most crime costs are counted as contributions to economic growth, and are therefore perversely interpreted as contributions to economic prosperity and wellbeing. The higher the crime rate, the more we spend on prisons, police, criminal trials, locks, guard dogs, burglar alarms and security systems; and the more we spend, the more our economy grows, so that crime costs are conventionally interpreted as a sign of progress in GDP-based measures.

By contrast, the new National Accounts will count crime as a liability rather than an asset, and its costs as an economic loss rather than gain. Thus, lower crime rates will be seen as a sign of progress, and reduced crime costs will be seen as savings that can be invested in more productive activities that build communities and enhance wellbeing.

As well, it is now widely recognized that safety and security are themselves outcomes of a wide range of social and economic conditions and circumstances, and are linked to income, employment, social supports, and other key variables. For example, as noted earlier, regression analyses demonstrate a strong statistical link between crime and unemployment.

From this perspective, money spent on crime prevention — including decreasing poverty, income inequality, social exclusion, and unemployment, for instance — can be seen as investments in a peaceful and more secure society, rather than as a cost.

From a full-cost accounting perspective, measuring the costs of crime also raises the very practical question of how much we have to spend as citizens for an acceptable level of security. If we need to spend less to maintain the same level of security, then our happiness, wellbeing, and level of trust in our community may be considered to have improved, and our standard of living to have increased in direct proportion to the drop in intermediate expenditures. If the cost of maintaining the same level of security goes up, our happiness, trust, and wellbeing may be considered to be eroding and our standard of living to be declining.

Comprehensive full-cost accounting estimates include a wide range of crime costs not included in more conservative estimates, such as costs associated with unreported crimes, the value of lost unpaid work attributable to crime, retail business 'shrinkage' due to employee theft and shoplifting, insurance fraud, and an estimate — based on court awards — for the cost of pain and suffering attributable to crime. By contrast, more conservative crime cost estimates include only public justice costs, victim and productivity losses due to reported crimes, defensive expenditures on security systems and guards, and the gap between theft insurance premiums and claims.

By failing to identify and measure such economic costs properly, and by misleadingly counting them as economic gains (as occurs when we mistakenly use GDP-based measures to assess progress and wellbeing), we lose sight of both the value and the potential deterioration of our social assets or wealth. That, in turn, can lead to serious policy failures when we fail to take preventive action to remedy trends that undermine our happiness, trust, and standard of living. No blame attaches to this failure because our economic accounting system has been sending misleading messages to policy makers and the general public alike. In fact, we have all been trapped in the materialist illusion that more output and spending necessarily produce greater wellbeing.

Conversely, the measurement and valuation of non-material human, social, and environmental assets not only draws attention to the genuine sources of true wealth, but can allow us to focus clearly and unambiguously on the legacy we are leaving our children and on the society we want to create and inhabit in the future. Such a society clearly includes high levels of physical safety, security, and peace. Trends in crime rates and perceptions of crime and safety are among the most well accepted measures of such societal peace and security, and well-established methodologies now exist to translate those trends into economic valuations for inclusion in Bhutan's new National Accounts.

**Educated populace**

The new National Accounts are based on the understanding that the wellbeing and happiness of Bhutanese society are correlated with certain key conditions, including physical and mental health, healthy ecosystems, decent living standards and economic security, strong social ties, safe communities, a vibrant culture, and the ability to balance the often competing demands of paid and unpaid work with ample leisure time. True wealth in the new National Accounts is also explicitly defined to include the welfare of future generations as well as that of the present generation.

Whether the Bhutanese populace has the *knowledge* required to improve happiness and sustainability is seen as a key connection among all the above conditions. In this sense, the educated populace dimension of the new National Accounts serves as vital connective tissue linking all the components of the new National Accounts.

For example:

- health literacy, including knowledge of nutritious foods, the benefits of physical activity, the hazards of smoking are necessary, and how and when to seek care and professional help are necessary to improve population health — a key dimension of human capital;
- ecological literacy, including knowledge of waste hazards, the value of forests, and the impacts of fossil fuel combustion are needed to protect and conserve natural capital;
- cultural literacy, including knowledge of traditional arts, folk tales, indigenous languages, tsechus, and Bhutan's ancient wisdom traditions will strengthen cultural capital;
- civic literacy is essential for citizens to cast informed votes, understand political processes, and hold governments accountable; and
- media literacy is necessary to read newspapers critically and intelligently.

All these in turn are core dimensions of good governance, of responsible civic engagement in Bhutan's new democracy, and of social capital.

Using national accounting language, declines in health literacy, ecological literacy, cultural literacy, civic literacy, media literacy and in other important fields of knowledge will first constitute a *"depreciation"* of human capital. As indicated above, however, that decline will also predict a future potential depreciation of social, cultural, and natural capital, and in other aspects of human capital like health. Still using accounting language, such evidence will point policy makers towards the need for *"investments"* in GNH-based education that will build the educated populace component of Bhutan's human capital stock and thereby enhance the country's human, cultural, social, natural, and economic wealth as a whole.

Abundant evidence indicates that education has significant impacts on income, population health, environmental quality, civic engagement, and other dimensions of wellbeing and happiness. Therefore, the evidence of whether or not Bhutanese are learning what they need to know to create a healthy, wise, and sustainable society should be seen in desirable social outcomes such as peace, equity, environmental stewardship, good health, tolerance, and other GNH values. For example, if people learn about and understand the connection

between burning fossil fuels and climate change, they are more likely to be motivated to reduce their fossil fuel use.

This overall view of educational objectives and indicators is considerably broader than that found in conventional education indicator systems that generally focus on school graduation and participation rates and other formal schooling measures. ***And broader education indicators are needed in order to create new full-cost education accounts.***

From this perspective, and in order for a society to assess social progress in general, and advances in learning and education in particular, it must first identify and define the kinds of knowledge required to create a healthy, happy, and sustainable society. In this endeavour, the key question in constructing broader education indicators is: What *is* an educated populace?

An extensive review of the research in this field revealed the following general consensus among a wide body of analysts, educators, and commentators about the key characteristics that constitute an educated person or populace:

- Engagement and capacity to learn throughout life with an attitude of openness, interest, and curiosity;
- Awareness of contextual situations and systems, social and economic interconnections, current world events, the processes of the natural world, the influence of current lifestyles on population health, and the choices and happiness of future generations;
- Ability to analyse, communicate, and integrate ideas;
- Ability to solve problems collaboratively;
- Willingness to engage in personal and social transformation;
- Knowledge in areas required to improve societal wellbeing, and using that knowledge for the public good.

In other words, an educated populace has the knowledge and skills required to foster wellbeing and happiness in individuals and in the population as a whole — that is, to live healthy lives, have decent jobs, participate actively in their communities as citizens, and understand the interdependent nature of the world in which they live — without imperilling these prospects for future generations.

The effective transmission and use of knowledge for societal benefit requires both basic literacy (reading, writing, and numeracy) and multiple literacies in relevant areas such as ecology, civics, arts, science, health, indigenous knowledge, and culture. Thus, an educated populace would have a reasonable understanding about important issues that affect daily life, which, in turn, requires practical skills like the ability to understand the meaning of statistics, how media present information, and how to make informed decisions when voting.

From the perspective presented above, an educated populace indicator and accounting framework should be able to track changes over time not only in the store of factual knowledge, but also in GNH values and attitudes, and in the happiness and wisdom of the populace. Those key dimensions of an educated populace are virtually absent from most conventional indicator systems that are confined to schooling outputs. As well, and with few

exceptions, like basic literacy assessments, most conventional education indicators also provide very little information about learning *outcomes* or social *outcomes*, which are the key concern of the new National Accounts.

An extensive literature review in the field undertaken by GPI Atlantic researchers, *Educating for Gross National Happiness in Bhutan: Developing Curricula and Indicators for an Educated Populace: A Literature Review,* found that the conventional education indicators that currently exist to assess educational attainment are extremely limited, and that most key learning outcomes are not adequately represented.[55] As well, those indicators — focusing as they generally do on formal schooling — do not adequately account for the role and outcomes of non-formal and informal learning processes and contexts, including the roles of the family, community, television, the Internet, and other media, which are often more influential in shaping attitudes, knowledge, and behaviours than schooling.

In addition, the evidence indicates only a weak — and often misleading — link between many conventional education indicators and actual educational attainment. For example, graduation rates may be a better indicator of labour market conditions than of educational attainment, since families who need children to help with farm labour may need students to leave school early, while farmers who have adequate help will more likely keep their children in school. Conversely, Canadian statistics revealed that lucrative employment opportunities for youth led students to drop out of school, while poor labour market conditions and job prospects prompted them to remain in school. Similarly, standardized test scores have often been found to be a better indicator of socioeconomic status than of educational capacity.

Following a three-year study of educated populace measures, GPI Atlantic strongly recommended the development of a new Knowledge Survey that would indicate levels of knowledge and lifelong learning in the populace in 10 specific knowledge areas — ecological literacy, scientific literacy, arts and culture literacy, health literacy, food and nutrition literacy, civic literacy, multicultural literacy, media literacy, Indigenous knowledge literacy, and statistical literacy. Of course, other knowledge areas could be added to this list, such as knowledge of Bhutan's ancient wisdom traditions, and folk and historical literacy, for which data are already gathered in the GNH Survey.

Administered regularly, the proposed new survey would assess whether or not knowledge in these areas is improving, deepening, and expanding, and its results would be of great interest not only to statisticians, but also to educators, educational institutions, and policy audiences nationwide, as well as to the general public. Such a survey would effectively constitute an important and highly practical contribution to development of robust measures of an educated populace, which in turn can lead to development of a set of education accounts as part of the new National Accounts. GPI Atlantic has also developed an extensive list of desirable education measures for which data do not presently exist.[56] Development of such measures and appropriate data collection are prerequisites for constructing credible education accounts.

In sum, without data from broader and more meaningful education indicators, it is not possible at this time to account comprehensively for the benefits of a truly educated populace, nor to assess the costs of depreciation in this valuable stock of human capital.

Development of a nationwide Knowledge Survey as suggested above would be the first systematic step in this direction.

As an interim measure, however, it might be possible even at this early stage to include a few key aspects of some literacies in the new National Accounts. For example, the benefits of some aspects of cultural literacy (and the costs of its depreciation) might be possible to assess based on key CBS GNH survey data on cultural understanding, artisan skills, and language data. As well, it might presently be possible to assess some economic benefits from Bhutan's non-formal learning programs. As well, some targeted studies might be undertaken, such as a study of media literacy that might account for the costs and benefits to students — and the population as a whole — of television viewing. It is clear, however, that we are still a long way from capacity to develop comprehensive educated populace accounts.

**NATURAL CAPITAL: Stocks and flows (supply of ecological services)**

**Soils and agriculture**

Ample good quality land suitable for agriculture, and a high level of biodiversity, healthy soils, and economic viability on farms points to a healthy and viable agriculture sector, and rich natural capital in agricultural soils. Fortunately, existing Ministry of Agriculture data, including from the National Soil Services Centre, provide much of the data required to begin building robust Soils and Agriculture Accounts for Bhutan's new National Accounts.

To appreciate the function of natural capital in this area in providing direct economic services to society, it must simply be acknowledged that agricultural production first and foremost depends on a healthy, fully functioning ecosystem. In other words, the production of food depends on the services nature provides, such as soil formation, nitrogen fixation, nutrient cycling, pollination, waste decomposition, pest control, bioremediation of toxins, and many others. In accounting language, soil and habitat for beneficial organisms are examples of "stocks" of natural capital, while the services they provide (as in the examples in the previous sentence) are called "flows."

Biodiversity is one key example of natural capital, and refers to both the diversity of living organisms (a stock), and the interactions among those organisms and the services they provide (flows). In order to understand biodiversity and its importance for maintaining healthy, functioning ecosystems — including agricultural ecosystems — we need to study those organisms, and ascertain their numbers, diversity, functions, and preferred habitats. We particularly need to understand and value the productive work that these organisms do, and how that work may be supported, nurtured, and encouraged on farms to produce ample, high quality farm products. In fact, biodiversity is the foundation upon which the earth's productive capacity is based.

We might be able to produce food with diminished biodiversity, but it would become a progressively more expensive enterprise — both financially and ecologically — as it would increasingly depend on costly synthetic inputs that are likely further to undermine soil quality. Thus, building natural capital accounts for soils and agriculture must also include evaluations of the state of biodiversity on farms. One way to assess the health of agricultural biodiversity is to monitor the habitats of organisms that we know are beneficial. Certain

types of land use can create critical and excellent habitat for a myriad of organisms. In return, these organisms can be harnessed to provide vital, productive ecosystem services for farms.

In addition to biological diversity, soil is the key natural capital asset in which our agricultural system is rooted and without which it cannot function. It is vital to maintain healthy and productive soil if our agricultural system is to continue to function optimally. And yet, although its importance is obvious, soil is currently undervalued in our food production system. In fact, methods of agriculture that degrade the soil are profitable in the short term under our current conventional system of accounting and valuation. This perverse outcome occurs because losses of natural capital due to soil erosion or degradation are invisible in conventional economic accounts, and their costs — though very real and scientifically demonstrable — are therefore not included directly in the costs of food production.

The Soils and Agriculture Accounts of Bhutan's new National Accounts will explicitly recognize the *long-term* value of our soil assets as true wealth, and count their depletion or degradation as depreciation in natural capital. In order to maintain and increase the value of our natural capital stocks in soils and agriculture, society as a whole must have a measurable way of ensuring that soil quality is maintained or improved. Based on Ministry of Agriculture data sets, the new National Accounts will provide that measurable evidence on a regular basis.

Farming and food production require a special combination of elements to be successful — including the best and most fertile available land. In Bhutan, some scarce fertile land is being converted to residential and commercial development at the very time that the need and demand for local fresh farm produce is increasing. Such losses do not show up in our conventional accounts. On the contrary, if the market output or rents generated by the converted land exceed the market value of prior agricultural production, the conversion will be recorded as economic gain in conventional accounting mechanisms.

Bhutan's new National Accounts, by contrast, will assign explicit value to fertile farm land and good soil quality as natural capital stocks, and they will record declines in highly fertile land as losses in the country's stock of natural wealth. Recent sharp increases in global food prices and in the price of fuel, commodity price fluctuations due to storms, climate change, drought, and other events, and increasingly serious safety concerns related to imported food have together led to renewed insecurity about food supplies and to interest in improving food self-sufficiency and reducing dependence on imported food supplies that may be uncertain and subject to increasingly expensive transportation costs. As well, security experts warn that secure local food supplies may be more essential to national security than large armies.

These current circumstances give new importance to the issue of land capacity, and to the questions of whether Bhutan has sufficient good farm land to enhance food self-reliance and whether it can afford to convert scarce fertile land to commercial and residential uses.

As well, there are considerable direct economic benefits generated by farms both for the rural communities in which they are situated and for the larger economy. It is therefore important for the new National Accounts also to assess key indicators of farm economic

viability in Bhutan so that policy makers can assess whether these direct economic benefits are secure or endangered. To this end, four key accepted indicators of farm economic viability are: net farm income, expense to income ratio, debt to net farm income ratio, and solvency ratio (whether farm debt is outstripping any appreciation in the capital value of the farm). As well, the new National Accounts can access whether an increasing or declining percentage of Bhutan's food consumption expenditures are going back to Bhutanese farmers. Such measures of farm economic viability are also directly related to soil health, since enhanced economic viability expands farmers' capacity to be good stewards of the resource.

A key purpose of the new National Accounts is to provide an early warning system of potentially troubling trends so that corrective interventions and remedial action can be undertaken before development of a real (and potentially irreversible) crisis. Thus, adverse trends should spur sufficient public, government, farmer, and private sector action to reverse those trends and enhance the economic viability of farming in Bhutan.

Otherwise, those adverse trends could continue to the point where recovery is no longer an option for many farmers, and they will be forced either to abandon farming or to sell off portions of their farms. Needless to say, this would have disastrous consequences for the food security of Bhutan. Sadly, such trends are already in evidence in burgeoning rural-urban migration trends that — at least in some cases — are linked to perceived lack of economic viability in farming. In his 2000 National Address to the Nation from Trashigang, His Majesty the Fourth King, with his customary wisdom and foresight, saw this connection clearly:

> If we do not make any effort to change this trend of large numbers of our villagers leaving to seek employment in urban centres, there is every possibility that, within the next twenty years, most of our villages will become empty and even our ancestral homes and farms will be abandoned. One of the most important steps that must be taken to encourage our people to remain in their villages is to make farming profitable and to increase the income of our farmers.

It is therefore a key purpose of Bhutan's new National Accounts to track such trends in farm economic viability, as well as in other measures of agricultural sustainability, clearly and closely. In doing so, they will hopefully send early warning signals to policy makers *before* lack of farm economic viability translates into even larger "numbers of our villagers leaving to seek employment in urban centres" and *before* "most of our villages will become empty and even our ancestral homes and farms will be abandoned."
In the new democracy and without His Majesty's firm guiding hand, it is even more important that feedback mechanisms like the new National Accounts send accurate and timely information to policy makers so that they can act effectively "to encourage our people to remain in their villages" and "to make farming profitable and to increase the income of our farmers."

Sound agricultural policies aimed at enhancing local food security and food self-sufficiency need to address these key issues of protecting fertile land, and enhancing soil quality, biodiversity, and economic viability in agriculture. This again is in fulfillment of His Majesty the Fourth King's expressed wish for Bhutan to become "self-sufficient in food grains" in

his own words. Shifts from reliance on food imports to local/ organic food, for instance, will require the collaboration of all economic, government, and social sectors, including the media and a public more discerning and determined to buy and eat local food and to support Bhutan's farmers. By valuing natural capital in soils and agriculture explicitly, in sharp contrast to the present conventional accounts, the new National Accounts will help bring policy and public attention to this vital area.

**Forests**

In our current national accounting system and GDP-based measures of progress, the intrinsic value of the natural environment is ignored, and forests are only given a monetary value when they are cut down and the timber is sent to market. Forests are not valued for the essential ecosystem and life-support services they provide when left standing. It is especially important for the Kingdom of Bhutan to include the full value — or true wealth — of forests in the new National Accounts since almost 75% of the country's land area is presently forested. Indeed, the Constitution of the Kingdom of Bhutan mandates that a minimum of 60% of the total land area of Bhutan remain forested "for all times to come."

Through properly and fully valuing the wide-range of vital services that forests provide, the new National Accounts will provide the economic justification for that brilliant and foresighted commitment, which stands in such sharp contrast to the policies of so many countries that have decimated their forested wealth.

Our natural world provides and performs a wide range of ecological, social, and economic functions, providing people with both direct goods and services like wood, food, minerals, and recreational opportunities, and indirect goods and services, including life support functions that enable human society and the economy to function. For example, an intact, optimally functioning forest ecosystem provides, at no cost, a wide range of vital services, including climate regulation, habitat and watershed protection, flood and natural pest control, prevention of soil erosion and landslides, formation of topsoil, nutrient recycling, and long-term storage of carbon. It also provides us with high quality wood, wild foods, and a place to relax and rest our minds.

The beneficiaries of many of the most crucial ecosystem services provided by forests are beyond Bhutan's own borders. For example, every tonne of carbon sequestered from the atmosphere and stored by Bhutan's forests provides protection for the people of Bangladesh, Tuvalu, Malta, Mauritius, Nepal and many other countries around the world that are particularly vulnerable to climate change impacts like sea level rise and glacial melting. And the value of Bhutan's forests in protecting highland watersheds may be greatest for the millions of people downstream of Bhutan's glacier-fed rivers, whose very lives depend on the reliable water sources and supplies that emanate from this country.

The economic valuations provided by Bhutan's new National Accounts will therefore be critically important in any international system of "payment for ecosystem services" (PES), and can help make a strong case that the international beneficiaries of Bhutan's forest ecosystem services should contribute towards the cost of this country's stewardship of that vital source of natural capital. International climate change negotiations are already pointing

in these directions, so there is a very practical economic reason for Bhutan's National Accounts to provide the needed economic valuations that can help make this country's case in those negotiations.

Preservation of the capacity of nature to yield a full range of economic, ecological, social, and cultural benefits is sometimes called "holistic" forest use because this approach seeks to optimize the full range of forest functions. It also recognizes that long-term timber productivity is itself dependent on the preservation of healthy forest soils, age and species diversity, and other vital non-timber functions. This broad view of sustainable forest use contrasts markedly with the current and historical "industrial" approach to forestry practised globally, in which the primary focus of forest management is to harvest enough wood fibre to meet all available and desired markets.
In the industrial model, "sustainability" is largely measured in terms of how much forest land is regenerated to commercial species. Water resources, wildlife, biodiversity, and ecosystem services receive only token consideration, if at all. When a forest is degraded, however, its ability to provide vital "free" services is compromised. Such services may be lost irreplaceably or diminished in quality and effectiveness, or efforts may be made to replace them through often expensive feats of human engineering. An accurate accounting system like that of Bhutan's new National Accounts will recognize and count such losses as a depreciation of natural capital, just as a factory owner currently counts a depletion or degradation in plant and equipment as depreciation of produced capital.

In 1997, an international team of scientists headed by Robert Costanza,[57] now of Portland State University's Institute for Sustainable Solutions in the U.S., conservatively estimated the average annual value of many of the world's key ecosystem services to be US$33 trillion — almost twice the total annual GDP of all the countries on earth. It should be noted, however, that putting a price tag on the total value of forests is highly problematic, in large part because there are many forest values that simply cannot be quantified. Omission of those values contributes to the conservatism of Costanza et al's global estimates.

Despite the acknowledged limitations of monetization, it is still important for the new National Accounts to use the technique, to the extent possible, to make the intrinsic values of natural forests more clearly visible, and to ensure that these values are duly and properly considered and taken into account in the policy arena. In other words, monetization can be seen as a necessary strategy as long as most key values of standing forests continue to be ignored and thus assigned an arbitrary value of zero in the conventional accounting mechanisms.

In the first phase of a larger, multiyear project, Drs. Kubiszewski, Costanza, et al. have recently estimated the basic value of ecosystem services in Bhutan using a simple benefit transfer methodology to derive a simple assessment of the contribution of ecosystem services to wellbeing. Those results, which will be released in Bhutan in February 2012 alongside this present report, estimate the value to be $15.5 billion/year (Nu 760 billion/yr) — considerably more than Bhutan's GDP for 2010 of $3.5 billion. Forests contributed *93.8%* of this total estimated value of Bhutan's ecosystem services, lakes and rivers contributed 0.9%, and land area contributed 5.0%. In further studies, the researchers plan to value ecosystem services using more sophisticated methods that will elaborate these initial

valuation estimates in more detail and with greater accuracy and precision, and will explain how those values can be properly integrated into Bhutan's new National Accounts.

## Energy

*Energy sources* constitute a "stock" of natural capital, while *energy use* constitutes a "flow" that makes demands on this stock, depleting it if the stock is non-renewable as in the case of fossil fuels. As described earlier, good natural capital accounts must include both "stock accounts" and "flow accounts," just as conventional accounts also consist of produced capital asset and liability balance sheets (stocks) and GDP, income, and consumption measures (flows).

The big difference is simply that the new National Accounts will consist of stocks of natural, social, human, and cultural capital in addition to the produced capital conventionally measured, and they will account for both the market and non-market flows that *all* those capital assets provide rather than only the monetary market-based flows currently measured. Thus, this energy component of the new National Accounts falls into both the Natural Capital domain that deals with supply and the Human Impact on the Environment domain that deals with demand.

Energy is essential to all life on earth. Whether as nourishment to sustain individual organisms or as fossil fuels to run modern societies, every activity on earth is dependent on constant, abundant, and reliable sources of energy. Any interruption to modern energy supplies can have serious consequences for the economy and society, jeopardizing standards of living.

But the intensive use of energy, especially energy obtained from fossil fuels, is also the primary cause of a number of environmental, social, and economic concerns. Current energy production and consumption patterns have been linked to global climate change, local health effects, and regional impacts such as air and water pollution, damage to marine and other wildlife, land-use conflicts, security concerns, resource depletion, and soil contamination.

Until recently however, attention on energy matters has been focused predominantly on discovering and developing new fossil fuel-based energy sources and securing existing ones, with little regard for the health and environmental impacts these create. The benefits of abundant supply were considered to outweigh the social and environmental costs of maintaining that abundance. This remains the philosophy in the continued development of Canada's tar sands (the second largest pool of carbon in the world after Saudi Arabia), and in many other parts of the world.

Increasingly, however, the potential perils of global warming in particular have changed that primitive view and understanding. When the full costs of energy use are now included in the equation, as will be the case in Bhutan's new National Accounts, the current model is seen to be unsustainable.

From a holistic perspective, a sustainable energy system is defined as one that has the following components:

- Reduces demand for and dependence on conventional fossil fuel-based energy supplies through changes in consumption patterns, including changes in behaviour and more efficient use of energy;
- Increases reliance on renewable sources of energy;
- Uses cleaner sources of conventional energy, such as natural gas, as bridging fuels, and develops ways to reduce the impacts of more polluting sources;
- Ensures accessibility to adequate energy services at a reasonable cost for all sectors of the population in the most environmentally sustainable way.

Bhutan's new full-cost National Accounts will provide the economic rationale and policy case for continued investment in all four of these areas, especially in improving energy use efficiency and further development of renewable energy sources, as a pathway towards further sustainability and security in the energy sector. To that end, the new National Accounts will integrate data on the costs and benefits of primary energy production such as hydropower, imported energy,[58] use of fossil fuels and renewable energy, air pollutant and GHG emissions from stationery energy sources and vehicles, total energy demand, energy consumption patterns and energy demands (e.g. from households, transportation, industry, etc.), and accessibility to adequate energy services.

**Air quality**

The atmosphere supports the lives and activities of human beings and of millions of other species of plants and animals. Despite its vastness, even the farthest reaches of the atmosphere, such as the ozone layer in the upper atmosphere, have become contaminated and altered through pollution, partly from natural causes but primarily as a result of the activity of a single species — human beings. The air we breathe is, therefore, never completely unpolluted, and contains elevated levels of dust particles, pollen, fibrous minerals, ash, and gases and compounds such as sulphur oxides, nitrogen oxides, ozone, carbon monoxide, and organic gases and vapours.

Without clean air, we can expect ongoing damage to our ecosystems, our health, and our economy. Air pollutants are known to have substantial impacts on the health of waterways, the productivity of forests, and agricultural crop yields. They also reduce visibility through haze formation that impacts our enjoyment and experience of our environment. Some of the trans-boundary impacts of air pollution in Bhutan are described in a recent study reported in the 2 May 2011 *Bhutan Observer* under the title "Brown cloud penetrates Bhutan."[59]

Extensive research in the last two decades has established a strong correlation between air pollution and many health ailments. Statistics show that more people die and are admitted to hospital for heart and lung problems on days with elevated levels of air pollution, and that people, on average, do not live as long in cities with high levels of air pollution when controlling for other factors like socioeconomic status and behavioural risk factors. If air pollution increases susceptibility to sickness, as the evidence clearly indicates, then it also contributes to the social and monetary cost of caring for those affected, and it correspondingly diminishes individual happiness and wellbeing.

Apart from the direct physical damage by air pollution to health, the environment, and

materials, the available evidence also points to known, less tangible, pollution-induced economic costs related to lost productivity, diminishing availability of natural resources, and social disruption, which must also be taken into account when assessing the overall effect of air pollution on human society and on the planet. One key goal of full-cost air quality accounts, in addition to providing important information on air contaminant emissions, ambient air quality, and health and environmental damages due to air pollutant emissions, is, therefore, to produce a basic ratio between unit changes in ambient air pollution and economic costs, so that policy makers can, in a simple way, be provided with a snapshot of the full range of environmental, human health, and economic costs associated with poor air quality.

Although the air quality in Bhutan is still relatively unpolluted at least at higher altitudes in rural areas, Bhutan is vulnerable to trans-boundary pollution from other countries and the effects of this pollution, as air and pollutants circulate the globe. At lower altitudes in southern Bhutan, trans-boundary pollution is likely already impacting both human health and agricultural productivity, and pollution from proximate point sources like industries in Pasakha, gypsum mines in Pemagatshel, the Dewathang coal mine and elsewhere is adversely affecting segments of Bhutan's population.

In addition, the escalating number of trucks and automobiles on Bhutan's roads are compromising air quality, especially in cities like Thimphu, due to increasing emissions. Industry, especially cement plants and mining operations, smoke from wood stoves and open fires (especially those burning plastic and other litter), road construction, and forest fires also contribute to air pollution. In sum, accurate accounting for Bhutan's air quality and the associated human, social, and economic costs of its deterioration are very important to integrate into Bhutan's new National Accounts.

**Water quality and resources**

Water is essential for all life on earth, including human health — in fact, it is estimated that human adults living in temperate climates and having moderate physical activity need between 2.5 and 3 litres of clean water per day for survival.[60] We use water not only to sustain physical health, but also as the most basic cleaning agent, for agriculture, and for relaxation and enjoyment. As well, lakes, rivers, and wetlands provide habitat for thousands of organisms from bacteria and fungi to amphibians, fish, birds, and mammals, and provide a wide range of vital ecosystem services that support life, protect against erosion, cycle nutrients, filter and absorb wastes, and much more.

Some contaminants are found naturally in water — for example, some water bodies may have traces of arsenic present. However, most current aquatic and human health hazards result from contaminants released to the environment by humans. These include pesticides and other organic compounds, metals, fluoride, radionuclides, microorganisms, nutrients (nitrates, phosphates), and other substances.

There are many sources of water pollutants. Substances in the air, such as toxic chemicals, sulphur and nitrogen oxides, and lead, are collected in the rain that falls. Water collects substances as it runs across natural and man-made surfaces, producing runoff. In urban areas, water runoff increases the concentration of substances such as nutrients, sediments,

and petroleum products in lakes, rivers, and groundwater — degrading their quality.

Industrial, farming, forestry activities, and human littering can also increase concentrations of toxic chemicals, nutrients, pesticides, and suspended sediments in water sources, which in turn can lead to increased erosion, habitat degradation, eutrophication of lakes and rivers, and low dissolved oxygen in water ways. To prevent household degradation of water, it is therefore illegal to wash clothes or vehicles in or near water bodies in Bhutan and to throwing wastes into water bodies.[61] Improper treatment of municipal sewage wastes can also lead to increased concentrations of pathogens such as bacteria and viruses in waterways.

Water quality is generally assessed and analysed according to categories such as drinking water, aquatic habitat, livestock watering, crop irrigation, and recreational water uses. All of these categories relate to the health of both aquatic ecosystems and the living organisms, including humans, which depend on their water resources. All of the potential impacts of water pollution impose various economic and social costs that would be quantified in full-cost National Accounts — including the cost of treating illnesses that range from typhoid, cholera, and dysentery in countries where contaminants enter the drinking water supply to minor respiratory and skin diseases, costs to restore and clean contaminated drinking water supplies, increased flooding and flood control costs, and loss of opportunities for recreational water use.

Other key issues of concern relate to changes in the value of water resources in Bhutan, including the possible loss of wetlands and the loss of glacial ice, which both provide crucial ecological services. The value of these important resources, and costs of losses in both of these natural assets can be estimated and included in the new National Accounts.

For example, a comprehensive inventory of Bhutan's wetlands including time series showing wetland losses will enable damage, restoration, and health costs associated with wetland services, wetland loss, and water pollution to be estimated. As noted earlier, the costs and consequences of glacial ice losses will be partially experience beyond Bhutan's borders, with millions endangered downstream due to both flooding and later water shortages as water sources dry up. Loss of glacial ice will also adversely affect hydropower generation in Bhutan.

Historically, increasing water demand and declining water quality have been addressed by developing new sources of water, if possible. However, the economic and environmental costs of developing new water sources have increasingly been seen as unsustainable to meet future needs and demands. Instead, policy attention has increasingly focussed on protecting and improving existing water supply systems to make them more efficient, equitable, safe, accessible, and environmentally benign — all of which also incur costs.

Although Bhutan does currently collect data on water quality and resources, more research and data collection in this area will probably need to be conducted to develop a full cost account of the comprehensive value of the country's water resources and the costs of water pollution and water loss in Bhutan.

Water has been called "our most precious resource." One NATO study warned that "water shortage is generally seen as the environmental problem most likely to lead to violent

conflict," and other studies point to the potential for mass migrations due to water scarcity.[62] These global realities strengthen the case for the value of Bhutan's precious water sources, currently invisible in conventional accounting mechanisms, to be properly documented and accounted for in the new National Accounts.

## DEMANDS ON NATURAL CAPITAL: Human impact on the environment

As noted above, natural capital stocks are subject to demands from human activity. That activity may be sustainable, meaning in accounting terminology, that we live off the "interest" generated by the capital asset. For example, if timber is harvested at the same annual rate that a forest generates new fiber, and without compromising forest quality, then we consume only the "interest," and natural capital is not depleted. But if we over-harvest beyond regeneration rates, we deplete forest capital, and if we use harvest methods like high-grading, we degrade forest quality. Such depletion or degradation are unsustainable and lead, in accounting terminology, to depreciation in the value of the natural capital asset.

Good natural capital accounts that assess sustainability must therefore consider both the value of natural capital stocks and the demands made on those stocks by human activity, which are considered flows. They will identify whether those demands are sustainable over time or whether they are producing excess flows or flow types that degrade stock quality, both of which in turn compromise the capacity of the stocks to supply future needs.

In addition to agricultural demands on soil, timber harvesting, energy use, and water use — all referenced above, we here consider three other human activities that create major demands on natural capital — solid waste generation, greenhouse gas emissions, and transportation. Each of these will be represented by a separate set of flow accounts in Bhutan's new National Accounts. In addition, the new National Accounts will include a set of comprehensive Ecological Footprint accounts that assess, on a per capita basis, the level and sustainability of Bhutanese consumption habits as a whole in relation to the earth's finite capacity to supply the necessary resources.

### Solid waste

Sustainable solid waste resource management systems generally involve recycling, composting, and improved ("second generation") landfills, and they effectively combine regulation with citizen education and participation. High rates of waste diversion from landfills are largely due to high rates of composting, which in turn result from bans on compostable organic material from landfills. Such bans substantially reduce greenhouse gas (GHG) emissions resulting from methane gas and protect surface and groundwater from leachate contamination.

An example of a successful solid waste resource management system is that implemented in 1996 in Nova Scotia, Canada, which has become an international leader in waste diversion, with province-wide curbside pick-ups of recyclables and compostables, and close to 50% of all waste now diverted from landfills. From a full-cost accounting perspective, despite increased operating and amortized capital costs, the new solid waste resource system

generates net annual savings of at least $31.2 million compared to the old. This translates into an annual saving of at least $33 for each Nova Scotian.

Those results are based on the most optimistic climate change models and are therefore highly conservative. Using more pessimistic models that include positive feedback loops accounting for permafrost melting and water vapour effects, the benefits of avoided greenhouse gas emissions in the new system generate savings as high as $168 million or $178 per capita annually. Providing such a range of low to high estimates in full-cost National Accounts substantially enhances the credibility of non-market valuations by showing in such a case that the new system more than paid for itself even using the most conservative assumptions, while additionally producing new jobs and substantial environmental benefits.

Costs considered in a full-cost accounting analysis of solid waste management systems can include:

- operating and amortized capital costs,
- costs of managing new systems for recycling beverage containers, used tires and other goods,
- public education on waste separation, and
- 'nuisance' costs to households reflecting the additional time required to sort waste.

Benefits include:

- reduction in greenhouse gas and pollutant emissions,
- energy savings (e.g. by using recycled vs virgin materials),
- extended landfill life,
- employment, and
- avoided liabilities.

However, solid waste cannot be managed through composting, recycling, and disposal activities alone. Good solid waste resource accounts will also attempt to account for the benefits derived from reduced consumption, re-use, reduction in packaging, and other actions designed to reduce waste at its source.

**Ecological footprint**

One of the best tools in the new measurement arsenal, and a key component of Bhutan's new National Accounts, is ecological footprint accounting, which gauges the human impact on the environment by an analysis of consumption patterns. Ecological footprint analyses, as well as greenhouse gas assessments, assess the extent to which high-GDP and high-income countries and groups consume far more resources and produce far more wastes and greenhouse gas emissions than low-income countries and groups. Ecological footprint analysis therefore forces us to question whether increased growth, income, and consumption in the rich countries are reconcilable on a finite planet with either improved living standards

in poor countries or with maintaining environmental quality and resource conservation for the benefit and use of future generations.

The ecological footprint concept is based on the simple reality that all human activities depend on nature's provision of life support functions, of the resources required to power the economy, and of the capacity to absorb the wastes we produce. Nature provides the air we breathe, our food and water, the energy we need for heat, light, transportation and to operate our machines, and the materials we use to build our houses and to make our clothes, computers, cars, paper products, and every other object that cycles through the economy. Nature also acts as the dump for our waste products. The carbon dioxide, acid gases, and particulate matter that our cars emit; the phosphates from our detergents and fertilizers; the synthetic chemicals found in plastics, paints, and other artificial products; the greenhouse gases and pollutants emitted by our power plants; and the garbage we dispose of all end up in our environment.

Human beings have an impact on the earth simply because they consume nature's products and services. Our personal ecological footprint, therefore, corresponds to the amount and type of nature's resources we use or occupy in order to live. This need not be of concern as long as the human load remains within the "carrying capacity" of nature. "Carrying capacity" refers to the ability of the natural world to support human activity, absorb waste, and renew itself without depleting natural resource stocks. The sustainability challenge, in short, is to attain a high quality of life for all while ensuring that resource consumption and waste generation remain within the carrying capacity of nature.

Ecological footprint accounting was designed determine the extent of human impact on nature and whether this impact and our present lifestyles can be sustained into the future. It shows how much productive land and water a given population requires to produce the resources it consumes and to absorb the wastes it creates. The ecological footprint therefore becomes a benchmark for measuring the "bottom line" of sustainability — human activity in relation to nature's carrying capacity. A footprint that corresponds with the capacity of nature to renew itself, to continue providing a flow of goods and services into the future, and to assimilate wastes without overloading the environment is an essential precondition for securing the wellbeing and happiness of present and future generations.

One particular power of ecological footprint accounting is that it explicitly links environmental sustainability and social justice, not as a matter of ethics, advocacy, or ideology, but as a simple matter of empirical description. If wealthy nations and wealthy individuals consume more resources and produce more waste and greenhouse gas emissions than less affluent nations and individuals, then their impact on the environment is also proportionately greater. In a world of limited resources and limited waste assimilation capacity, excess consumption by the rich literally requires that others live in poverty if we are not, in aggregate, to exceed the earth's physical carrying capacity.

Conversely, improved living standards and a reduction in poverty for those currently suffering deprivation and living in straitened circumstances also require that excess consumption be curbed if nature's aggregate carrying capacity is not to be exceeded. In sum, ecological footprint analysis cuts through the illusion that we can improve the living

standards of the poor without also examining closely the consumption patterns of the rich, and it thus inevitably supports greater equity among the earth's inhabitants.

Most measures of sustainable development subtly and implicitly place responsibility for greater sustainability on producers. While essential to assess the "supply" side of the sustainability equation, natural resource accounts for forests, fisheries, soils and agriculture, and energy, for example, inevitably focus on whether current harvesting and production practices are sustainable, thus subtly placing the onus of responsibility for sustainability on those who carry out those activities — like loggers, fishermen, farmers, utility companies, and other producers. Ecological footprint analysis, by contrast, assesses the "demand" side of the sustainability equation, and thus, shifts responsibility to consumers by assessing the impact of consumption patterns on the natural world. The critical importance of this component of Bhutan's new National Accounts, therefore, is that it clarifies that the sustainability challenge is the shared collective responsibility of all Bhutanese and that this responsibility increases in direct proportion to level of consumption and waste generation.

Ecological footprint calculations are based on two simple facts and measurable/quantifiable realities: first, most of the resources consumed by a population, and the wastes that are generated by that population, can be accounted for; and second, this resource consumption and waste generation can be converted into the biologically productive area necessary to sustain these functions. The ecological footprint of any defined population (e.g. a single person, household, village, dzongkhag, or nation) is the biologically productive area required to:

- Produce the food, wood, energy and other resources that humans consume;
- Provide room for infrastructure such as buildings and roads;
- Absorb the wastes, carbon dioxide, and other pollutants that result from human activity.

To provide results in comparable units of measure , all components of the earth's productive area are adjusted for their biological productivities. This means that land with higher than average productivity appears larger in footprint accounts in terms of the level of human activity it can support than resource-poor land. While such adjustments might seem daunting barriers to the application of ecological footprint accounting in Bhutan, the good news is that these adjustments by land type have already been reliably calculated by the renowned and reputable Global Footprint Network. So there is actually no obstacle to using the well-established existing formulae for these calculations in Bhutan's new National Accounts, and it will be possible without excess difficulty to use existing data sources on current consumption patterns to assess Bhutan's ecological footprint both in aggregate and by income group.

Since the resources we consume come from all corners of the planet, and since the wastes we generate, like greenhouse gas emissions, affect distant places, ecological footprint accounting considers the sum of all the ecological impacts of our consumption patterns no matter where such impacts occur on the planet. For example, if Bhutanese eat rice from India and make furniture out of wood from Thailand and clothes out of brocades from China, the land area required to produce these commodities consumed in Bhutan —

regardless of where they are produced — is counted as part of Bhutan's ecological footprint. Conversely, if Indians consume Bhutanese hydropower, the ecological impact of that consumption is counted as part of those Indians' ecological footprint.

It is also important to recognize that current ecological footprint estimates err on the conservative side. Low-end figures have been consistently used whenever available data indicate a likely range of estimates. For example, areas set aside for the protection and treatment of water resources are not included in ecological footprint estimates, and areas required for the absorption of wastes, pollutants, and toxic materials other than carbon dioxide have been omitted due to methodological and data limitations. In addition, footprint analysis takes no account of the probability that chemical pesticide and fertilizer use, soil compaction, clear-cutting, and other unsustainable harvesting practices will reduce future soil productivity. These assumptions render current footprint analyses highly conservative.

Possibly the most conservative assumption in current footprint calculations is that they provide no allocation of biocapacity to other species, but rather assume that all the earth's biocapacity is available for a single species alone — namely human beings. Since we share the planet with over ten million other species, it is clearly not possible to use the entire bioproductive ecological space of the planet solely for human consumption. Indeed, it is doubtful that the human species itself could survive if it used all productive resources for its own needs at the expense of all other species.

Since half of Bhutan's land area is currently protected through national parks, nature preserves, and wildlife sanctuaries, which are areas not available for timber, agriculture, mining, and other human activities, and a minimum of 60% of land legally must remain forested, estimates of bioproductive capacity should actually be reduced to reflect such consumption-related exclusions. To its great credit, Bhutan is well over the recommended minimum "essential set-aside" of 30% of land area that many conservation biologists say is required for effective biodiversity preservation and to slow the current extreme rate of species extinction. But the point here is that the standard, comparable ecological footprint accounting that would be used in Bhutan's new National Accounts, using existing globally accepted formulae, greatly under-estimates the human impact on the environment because it includes no such "set-asides" for other species.

The idea and potential feasibility of assessing humankind's ecological footprint was first conceived in 1990 by Mathis Wackernagel and William Rees at the University of British Columbia in Canada, and the tool has now become one of the most important and well accepted methods of assessing sustainability. In 2003, Wackernagel created the Global Footprint Network (GFN) to establish a consistent, rigorous, and comparable methodology for calculating ecological footprints, and a straightforward and non-misleading manner for reporting results. GFN now produces annual National Accounts that ensure that the footprints of different nations are calculated, presented, and reported comparably, and in June 2006, GFN launched the first *Ecological Footprint Standards*, which govern the way in which footprints are now calculated.

The ecological footprint is expressed in global hectares (gha) — 1 gha represents the productive capacity of 1 ha of land at world average productivity. According to the 2010 *Living Planet Report*, the Global Ecological Footprint in 2007 was 18 billion gha, or 2.7 gha

per person on the planet, while the biocapacity of the earth was only 11.9 billion gha, or 1.8 gha per person.[63] This ecological "deficit," or "overshoot," of the earth's carrying capacity means that it takes the earth approximately a year and six months to produce the resources humans use in one year. This also means that in 2007 people used the resources of the equivalent of 1.5 planets. The accumulating ecological debt will be borne and paid by future generations.

In 2007, the ecological footprint was highest for the United Arab Emirates and Qatar (10.68 and 10.51 gha per capita, respectively) and lowest for Bangladesh and Timor-Leste (0.62 and 0.44 gha per capita, respectively). Bhutan was not included in the estimates since its ecological footprint has not yet been calculated. Other pertinent ecological footprints were: United States (8 gha per capita), China (2.21 gha per capita), and India (0.91 gha per capita)

The global results show that more than 4.5 planets would be need to supply the necessary resources if everyone in the world consumed at the rate of those living in the Gulf states and the U.S. However, only half the planet's biocapacity would be used on an annual basis if everyone consumed at the Indian average rate. Needless to say, these national averages do not account for internal income disparities, so good footprint accounting will also provide intra-national breakdowns by income quintile.

Bhutan's use of hydro power; its high level of subsistence farming that relies on local rather than imported vegetables, fruits, grains and other fresh foods; and its still relatively low aggregate rate of automobile ownership will all contribute to a relatively small footprint that can still be a practical model of sustainable development. On the other hand, the footprint also records increases over time in automobile ownership, petroleum consumption, and imported goods as an expansion of footprint size, thus demonstrating some of the unwanted environmental impacts of shifting Bhutanese consumption patterns. Such vitally important information incorporated into Bhutan's new National Accounts is essential to foster GNH-based development.

There is no doubt that Bhutan's ecological footprint, while still low by global standards, is very much larger than it was 40 years ago when the country had almost no motorable roads, and relied almost entirely on subsistence farming to feed its population. Now, with more than 5,500 km of roads and dramatically higher per capita incomes, the benefits of economic development are also accompanied by a correspondingly greater impact on the environment.

Ecological footprint analysis is not an argument *against* economic development which, in Bhutan, has also dramatically improved life expectancy, population health, and literacy. But it does objectively track the environmental impacts of shifting consumption patterns, and thus provides important information on the consequences of alternative development options that can inform policy in highly constructive ways. For example, footprint accounting can suggest transportation policy and land use planning options that reduce vehicular traffic, impose higher customs duties on large, petrol-inefficient vehicles, and make services more easily accessible by foot, and it can calculate the consequent footprint reductions of such measures.

In sum, ecological footprint accounting is vital component in Bhutan's new National Accounts in order to reveal how particular lifestyles, behaviours, consumption patterns, and

types of energy use differentially impact the environment, and to suggest policy options that can keep Bhutan's footprint low and within sustainable limits.

**Greenhouse gas emissions**

On 9 November 2011, the International Energy Agency (IEA) warned: "Rising fossil-fuel energy use will lead to irreversible and potentially catastrophic climate change." Despite Rio, despite Kyoto, despite Copenhagen, global $CO_2$ emissions rose by 5.3% in 2010. Bhutan and Nepal can no longer stave off glacial melting that threatens devastating glacial lake outburst flooding, and shrinking sources of water for hundreds of millions downstream. Without immediate action, warns the IEA, by 2017 all $CO_2$ emissions will be "locked in" by existing power plants, factories, buildings and other infrastructure. The UNDP calls climate change "the greatest challenge facing humanity."

Clearly, therefore, the most critical area in which action is urgently required is in the reduction of greenhouse gas emissions (GHG). In 2007, the Intergovernmental Panel on Climate Change (IPCC) noted that eleven of the last twelve years ranked among the warmest since 1850, and the warming trend in the last half-century (between 1956 and 2005) has been nearly twice that of the century-long trend between 1906 and 2005. Global average sea level has risen at a rate of 1.8 mm per year since 1961, and 3.1 mm per year since 1993. Annual average Arctic sea ice has shrunk by 2.7% per decade since 1978 and mountain glaciers and snow cover have declined in both hemispheres.[64]

According to the IPCC, global atmospheric concentrations of greenhouse gases have increased markedly as a result of human activities since 1750. Global greenhouse gas (GHG) emissions due to human activities grew by 70% between 1970 and 2004 alone, and the IPCC has determined that it is very likely that most of the observed increase in globally averaged temperatures since the mid-20th century is due to the observed increase in anthropogenic (human-induced) GHG concentrations.

Not only are humans contributing to climate change that is already occurring, but the IPCC projects that global GHG emissions will continue to grow over the next few decades as a result of current management and policies, and that continued GHG emission levels at or above the current rate will result in positive feedback loops, causing further warming and inducing many more changes in the global climate system.

In short, as the UNDP and others have stated explicitly, climate change is now acknowledged as the most serious environmental challenge of the coming century and perhaps the most serious economic and social challenge as well. Predicted impacts of climate change in Bhutan include an increase in extreme weather events, glacial lake outburst floods, increased landslides, flash floods, and droughts, as well as adverse impacts on forests, and hydropower and agricultural industries. In addition to environmental impacts, climate change also poses serious health concerns, including temperature-related illnesses, vector-borne diseases, and air-pollution health effects.[65]

In the industrialized countries, policy makers often argue that addressing climate change through large cuts in GHG emissions will be too costly and will weaken the economy. In

developing nations, policy makers argue that the industrialized countries bear primary responsibility for global warming and that they themselves would unacceptably reduce their own growth rates, competitive advantages, and poverty alleviation efforts by reducing emissions.

However, none of these arguments weigh the short-term costs of action (generally the sole policy consideration) against the long-term costs of predicted environmental and economic damages resulting from climate change. Both sides of the equation must be considered in any assessment of the true costs of climate change and in order to assess whether damage avoidance may provide substantial long-term economic benefits when all costs are considered.

A cost-benefit analysis conducted in Nova Scotia, Canada that did weigh both the long- and short-term costs found that when the costs of reducing the province's GHG emissions to 10% below 1990 levels by 2020 were subtracted from the benefits attained from that reduction in avoided climate change damages and cleaner air, the net cumulative benefit to society was likely to exceed $846 million.[66] Achieving the more ambitious David Suzuki Foundation and Pembina Institute target of a 25% reduction of GHG emissions below 1990 levels by 2020 would produce a net cumulative benefit of more than $1.8 billion. The analysis found that every $1 invested in reducing GHG emissions between 2008 and 2020 would save at least $29 in avoided climate change damages.

Even using the most conservative possible cost assumptions — comparing the most minimal predicted climate change damage costs based on the most optimistic climate change models with the most pessimistic (high-end) costs of reducing emissions — the economic benefits of reducing emissions were still found to exceed the actual costs of reducing emissions. What this means, in essence, is that greenhouse gas emission reductions are cost effective at any price when compared to potential climate change damage costs — using any range of estimates in the accepted literature.

This conclusion is strongly supported by the most thorough and comprehensive analysis of the economics of climate change ever undertaken. Lord Nicholas Stern, former Chief Economist and Senior Vice-President of the World Bank, concluded: "The benefits of strong early action on climate change outweigh the costs…. The costs of stabilizing the climate are significant but manageable [estimated at 1% of global GDP]; delay would be dangerous and much more costly [estimated at between 5% and 20% of GDP]."[67]

It is now widely accepted in the scientific community that considerably more drastic cuts in global GHG emissions than previously envisioned will be required to stabilize the world's climate and to prevent potentially catastrophic damage. In sum, good greenhouse gas accounts that include both control costs and damage costs are an essential component of Bhutan's new National Accounts, and will provide vitally important information for policy makers on the most cost-effective GHG reduction strategies. The new Accounts will also support Bhutan's Copenhagen climate summit vow to remain a net carbon sink in perpetuity, and will provide the essential economic evidence for Bhutan to receive credits for carbon sequestration in new international carbon trading systems.

Although Bhutan's per capita GHG emissions remain low compared to industrialized

countries, a 2011 GHG emissions inventory in Bhutan found that GHG emissions grew by 3.75% between 2000 and 2009.[68] The inventory found that GHG emissions in the industrial sector grew by 12.5%, and in the energy sector by about 10%. The energy sector includes transport and energy use in homes for lighting, cooking, and heating from all energy sources — wood, electricity, LPG, and kerosene. The inventory also found that methane and nitrous oxide from livestock were major contributors of GHG emissions in the agricultural sector.

Potential strategies identified in the inventory report to reduce GHG emissions included improved public transportation systems, greener industrial practices, and more efficient biofuel technologies. By translating existing inventory evidence into economic terms, using well accepted methodologies and globally accepted dollar values per tonne of carbon, the cost-effectiveness of alternative GHG reduction options can be explored to reveal which strategies will produce the greatest reductions for the least cost.

**Transportation**

Transport and residence patterns, as well as lifestyles, in Bhutan — following the pattern in industrialized countries throughout the world — are becoming increasingly automobile-dependent. Especially in Bhutan's urban areas, there are increasingly high levels of per capita vehicle ownership and use, and few alternative transport options. Unfortunately, in Bhutan, as nearly everywhere else in the world, most recent transportation trends are moving away from, rather than towards sustainability. For example, total road passenger movement is increasing, as is the use of cars, light trucks, and large 'land cruisers', while use of public transportation by bus is generally much less appealing.

However, Bhutan is in the enviable position of being able to learn from the mistakes of the industrialized countries and therefore not to fall into the same traps. During the last half century, for example, transit service has generally declined in North America; homes and businesses have become more dispersed; more neighbourhoods have been built that lack sidewalks; roads and paths have become less connected (with larger residential blocks and more dead-end streets); and the barrier effect (delay and risk that motor vehicle traffic causes non-motorized modes) has increased, making non-motorized travel more difficult. As well, alternative modes of transportation have often been stigmatized. The overall effect of these trends — at least in Canada and the U.S. — is that people drive more kilometres each year and spend more money on transportation, while non-drivers have fewer alternative options.

These trends are, in part, a result of various market distortions that encourage private motor vehicle travel — including under-pricing of road and parking facilities, fixed insurance premiums and registration fees that are unrelated to kilometres driven or vehicle fuel efficiency, uncompensated crash risks and damages, un-priced environmental and social impacts, planning and investment practices that favour improvements in private motor vehicle travel, and various land use policies that favour more dispersed development practices. Although individually some of these distortions may seem modest and justified, their impacts are cumulative and synergistic (i.e. total impacts are greater than the sum of individual impacts).

As a result of these market distortions, a significant portion of current motor vehicle travel is economically inefficient. In other words, in a more efficient and equitable market that accounted accurately for the full benefits and costs of different transportation modes, people would choose to drive significantly less, rely more on alternative modes of transportation, and be better off overall as a result. The present 'economically excessive' private motor vehicle travel — defined here as motor vehicle travel that results from market distortions — contradicts sustainability objectives. As a result, at the margin, and compared with current transport patterns, inclusion of environmental and social costs in transportation pricing mechanisms will not only reduce private motor vehicle travel but also increase sustainability.

For these reasons, it is necessity to include environmental and social costs in transportation and road pricing. Including such actual transport-related costs in Bhutan's new National Accounts is the necessary prerequisite and first essential step in pricing transportation more accurately to reflect its true costs, and thereby to develop a less economically distorted and more sustainable transport system altogether. Given that the transportation sector is also one of the largest contributors to GHG emissions and potential climate change damage, it is no longer an option to exclude or ignore climate change damages in transportation cost analyses.

A full-cost accounting of transportation costs considers a full range of economic, social, and environmental costs, and includes the full cost of private automobile use. Analyses to date show that about one-third of these private automobile costs are presently "external" — borne by society rather than by car users. Costs contained in full-cost transportation accounts include:

- vehicle operating and ownership costs,
- travel time and congestion,
- parking (user-paid and subsidized),
- costs of automobile crashes,
- climate change,
- air and water pollution,
- resource use,
- land value,
- road facilities and traffic services, and
- waste generation.

Some full-cost analyses have found that improved walking and cycling conditions, better public transit services, and more efficient pricing can help reduce traffic congestion, road and parking facility costs, consumer costs, accident risks, energy consumption, and pollution emissions, while improving public fitness and health, increasing beneficial economic activity, supporting strategic land use objectives (such as reducing sprawl), and even supporting specific objectives such as urban redevelopment, tourism activities, and heritage preservation.

In sum, full-cost transportation accounting can provide highly useful and practical information to policy makers on land use and transportation planning that can dramatically reduce current externalized transport-related costs and yield substantial social, economic, and environmental benefits.

A wide range of practical, tested, and proven policy and planning reforms have already yielded such actual benefits in various jurisdictions around the world, and have been outlined in several prior full-cost transportation accounting studies.[69] These are called "win-win transportation solutions" because each recommended intervention achieves multiple benefits across economic, social, and environmental dimensions. These interventions, which are naturally suggested by full-cost accounting transport analyses, have been proven to be cost-effective and technically feasible market reforms that help solve transportation problems by increasing consumer options and removing market distortions that encourage inefficient travel behaviour. In these ways, Bhutan's new National Accounts will inevitably lead policy makers to develop far more cost-effective and sustainable transportation patterns, yielding a wide range of economic, social, and environmental benefits, than have characterized the costly automobile-dependent patterns of most industrialized societies.

## 4.4 Additional examples of enlightened public and private sector policy-making based on full-cost accounting evidence

### Payment for ecosystem services (PES)

Accounting for natural capital will reveal Bhutan's vast true wealth, which furnishes tremendous ecological services in carbon sequestration, flood protection, and other valuable ecosystem functions that serve populations far beyond Bhutan's borders. Bhutan is providing a service to the world through its responsible stewardship of natural capital that requires recognition. Valuing natural capital in Bhutan's new National Accounts will make that service highly visible and make a strong economic case in international carbon credit negotiations for beneficiary support to Bhutan's provision of such protective, conservation, and stewardship functions.

In short, Bhutan is a producer of ecosystem services that are exported, and a key function of the new accounting system is to recognize this reality and the economic and social value of those exported ecosystem services explicitly. Since the service of carbon sequestration has a real economic value beyond Bhutan's borders, this should result in actual payments to Bhutan for performing that service. However, in the existing market and growth-based economic paradigm in which environmental benefits are excluded from conventional accounting mechanisms, there are no formally recognized international regulatory agencies to administer such payments according to accepted criteria.

Therefore, Bhutan's new full-cost National Accounts must literally be seen as the foundation of a new wellbeing and sustainability-based economic paradigm that will establish new international institutions to manage such payments for ecosystem services (PES). Only in this way, will it be formally and institutionally acknowledged that Bhutan's natural wealth

provides benefits beyond its own borders to ensure that the value and benefit Bhutan provides internationally is properly recognized and compensated.

Existing market mechanisms cannot, by definition, accomplish this function because they are firmly rooted in systems of private property and ownership. But many ecosystem services are "non-rival," which means that anyone can benefit from their effective functioning. So these ecosystem services must be seen as "common assets" or administered as a "common asset trust" over which one country happens to have stewardship and is compensated for such stewardship. In other words, these kinds of property rights therefore belong to the whole community that derives benefit from them. For example, once it is recognised that a watershed belongs to everyone who derives benefit from it, then one can charge people for damaging that watershed or reward people for improving it. This is the fundamental principles underlying what is commonly known as "payment for ecosystem services" (PES).[70]

Payment for ecosystem services is a system of sustainable financing for the conservation of ecological services. Basically, PES is the practice of offering incentives, which could be monetary, to persons, organizations, or other interested parties in exchange for taking care of and conserving natural resources that provide an ecological service to others. Thus, mutual benefits for both suppliers and consumers of ecosystem services are provided to households, communities, nations, and humanity in general. The consumers of the services are willing to pay a price for their wellbeing derived from the availability of the services, and the suppliers are willing to accept the price in exchange for their stewardship.

Globally, governments and organizations are increasingly using this strategy to help conserve natural resources, and these systems have been very successful in some jurisdictions. But, in the absence of internationally recognised and accepted PES regulatory mechanisms and institutions as part of a new sustainability-based economic system, attempts to turn ecosystem services into markets have been less successful, simply because ecosystem services are public and therefore not amenable to trade among individuals.

Therefore, successful PES systems remain local and within national boundaries, and will not be effectively internationalized until a new sustainability and full-cost accounting based economic paradigm replaces the present growth-based system that is the product of the so-called "Washington Consensus." That so-called "consensus" in turn derives from the 1944 Bretton Woods accord that was agreed at a time that the world did not yet know of natural resource limits, climate change, or any of the scientific evidence that now clearly shows the present growth-based system threatening human existence on earth.

One example of a PES system that is now operating successfully with widespread public support can be found in Costa Rica. Initially in Costa Rica, however, many interests opposed the introduction of systems of payment for ecosystem services. But once educated about the rationale and operation of PES systems, they now realize their importance and have come to appreciate that these systems result in benefits for everyone.

In Costa Rica, payments for conserving and protecting particular natural capital resources are valued according to how much government would have to pay to change the behaviour of farmers, loggers, landowners, and others to adopt and practice more sustainable,

conservationist stewardship measures. The value of these payments is clearly less than the actual value of the forests and other resources they are protecting, and can be seen as an "opportunity cost."

At present, Costa Rica's PES system pays landowners the same amount no matter where they are located in the forest, watershed, or other resource they are charged with protecting. However there has been discussion in the country that the value could potentially be adjusted depending on where farmers are located within a watershed, for example, since some areas are more important from a stewardship perspective. Costa Rica's PES program also collects fees from urban water users and eco-tourists and pays this money to farmers to replant forests. Thus, farmers in Costa Rica have discovered they can make more money reforesting than running cattle.

Costa Rica's innovative and effective PES system is one reason the country was recently ranked as the greenest country in the world; very first in the Happy Planet Index; top of the Americas in the 2010 Environmental Performance Index; the only country in the world to meet all five criteria for environmental sustainability; and cited by the UNDP 2010 as attaining much higher human development than other countries at comparable income levels.
As a very proactive and effective program, PES has now begun to be adopted to some degree in Mexico and Brazil. With its new National Accounts providing a clear and firm natural capital accounting basis for actually valuing such payments for ecosystem services accurately and effectively, Bhutan will be very well placed to be a pioneer in this area and even to demonstrate an effective foundation for adoption of such a system internationally as part of the new sustainability-based economic paradigm.

There are also many examples of the potential practical utility of a PES system in Bhutan. For example, a PES system might be very applicable to the persistent challenge of human-wildlife conflict (HWC) that is, in many respects, a by-product of this country's deep traditional respect for the lives of all sentient beings and of Bhutan's outstanding record of environmental protection, with 51% of the country now in protected areas. Bhutanese farmers could therefore be adequately compensated for agricultural losses to wildlife on the grounds of their contribution to ecosystem protection — which would include offering the animals food.

Such compensation is now very limited, and HWC is cited as a key reason many farmers find farming to be economically unviable and migrate to urban areas. However, wider and more adequate compensation is also likely beyond the country's limited financial means and resources. Again, therefore, effective implementation of such a PES system to deal with HWC will likely depend on international financial contributions that recognise the global value of Bhutan's habitat protection in conserving endangered species. Such international contribution may not need to wait for full global adoption of a new sustainability-based economic paradigm, but might be channelled through existing international agencies like the International Union for Conservation of Nature (IUCN), United Nations Environment Program (UNEP), or World Wildlife Fund (WWF).

Such a payment for ecosystem services system could also be a way to help farmers during the transition to organic agriculture in Bhutan on the grounds that those farmers are protecting soils and thus also performing a valuable ecosystem protection and stewardship service. A system of PES might also be developed to compensate those whose livelihoods are most adversely affected by the large network of national parks. For example, a portion of park entrance, trekking, and tourist fees — paid by those who particularly enjoy the unspoiled flora and fauna of Bhutan's protected areas — might be given to those farmers who suffer losses from these activities.

Rudiments of such PES systems already exist in Bhutan and could be implemented more systematically and widely on the basis of the natural capital valuations in the new full-cost National Accounts. Residents in Mongar, for example, have already indicated their willingness to pay farmers and herders in the upland watershed area for undertaking five particular activities that are designed to protect the town's water supply. Based on this example, the Bhutan Water Management Division (WMD) has now been given the mandate to explore PES and how the system can work effectively in Bhutan to support watershed protection. WMD has selected three pilot PES sites, but has not yet reached the valuation stage. Indeed, it is precisely with such valuations that the new National Accounts will assist greatly in providing the necessary data.[71]

A full-cost accounting mechanism is actually what establishes the value of the ecosystem services, which in turn determines the levels of investment and payment for ecosystem services required to protect those services. Also, PES systems can only be implemented if we know precisely what kind of conservation and protection services by which provider groups (potential recipients of PES) must be undertaken in order to ensure a reliable supply of such services to beneficiary groups (potential payers of PES). This requires careful mapping and modelling of how particular capital assets and ecosystem services function in specific landscapes.

In Chapter 3.3 above, we have already reviewed the steps required in proper valuation of natural capital assets and of ecosystem services. Please see Step 4 on Mapping and Modelling in the section on "Steps required in valuation of natural capital assets and of ecosystem services" in Chapter 3.3 above. Following this essential preliminary mapping and modelling exercise, which is used to establish the natural capital accounting foundation for any PES system, there are then generally four key additional steps involved in the process of actually assessing the right *level of payment* for ecosystem services:

1. First, it is important to look at the underlying science of the particular ecosystem service under consideration, to establish the linkages both between service provision and beneficiary use of those services, and also between actions and consequences. Both sets of linkages are important, and both must first be established through the available scientific evidence. The first of those linkages deals with the impact of the ecosystem service in either its natural or currently existing state, and the second set of linkages deals with the consequences of intervention.

   In other words, we first need to assess whether the proposed change of behaviour that we are trying to induce through a system of payment for ecosystem services will actually

be likely to have the desired consequences downstream. Thus, the first step in assessing the appropriate level of payment in a PES system is examining the science based on existing records pertaining to that ecosystem service and on modelled impacts of potential interventions at different levels.

2. The next consideration is fairness, which takes us into an entirely different realm from science and that has more to do with legal and rights questions. Payment levels must therefore also be appropriate to the prevailing social and cultural contexts and customs, and in relation to other societal groups not receiving those payments. PES systems should not lead to social disharmony, conflict, new social classes, or claims of bias, prejudice, or unfairness. If these considerations are not fully considered in any PES system, then it could well lead to claims of discrimination by groups not receiving the payments who perceive their own work and services as being equally valuable to those receiving the payments.

   Another psycho-social consideration in this realm is to determine how large a payment will likely be enough to change behaviours in the desired way. The level must not be so minimal as to have no discernible impact on behaviour and should also not exceed what is needed to have the desired impact. So the issue of a "right" level of payment has key social considerations in a second phase of investigation beyond the initial scientific assessment.

3. Third, PES administrators need to look at economic allocation, and ask what the best and most efficient mechanism is for collecting, allocating, and distributing the money. In fact here, the primary considerations in PES schemes are efficiency and arms-length neutrality. An organization like the Bhutan Trust Fund for Environmental Conservation might be considered for this role, since it fulfils those criteria and is already set up as an arms-length environmental stewardship and funding agency that collects funds from donors and allocates or distributes those funds to projects in Bhutan.

4. And the fourth step in setting up a PES system is determining the appropriate institutional arrangement for the PES and ensuring that it has good governance. This involves issues of who makes decisions and by what process, how are members selected to the Board of Governors, what procedures exist for arbitration or potential dispute settlement, and so on. Whenever money is involved in anything, reliable, trusted, and transparent governance systems are essential.

Interestingly, these four essential steps correspond precisely with the four pillars of Gross National Happiness. The first scientific step is the environmental pillar — understanding the ecological consequences accurately. The second step is clearly the cultural pillar. The third step is the economic one, and the last one obviously is the pillar of good governance. This illustrates again what a brilliant framework is already in place in Bhutan, through the GNH philosophy and approach, which makes intuitive here what is often a big conceptual leap in other cultures and contexts.

In fact, in Bhutan the integrative, holistic approach both of full-cost National Accounts in general and of specific policy applications like PES in particular, is entirely natural and consonant with the existing GNH-based understanding and philosophy. By contrast such a

holistic approach and its policy applications too often remain alien to the more fragmented, specialized, materialist, and silo-oriented paradigm dominant in western contexts. Thus, Bhutan is already culturally very well attuned to the PES view, and therefore likely much more ready than most to adopt and implement it widely.

This philosophical affinity does not mean that PES applications in Bhutan will not face practical challenges. Among the challenges in setting up a workable PES system for a particular location and in relation to a specific geographic set of circumstances, it is important to consider the intimate linkages between the macro- and micro- dimensions of economic valuation work in the sphere of natural capital and ecosystem service accounting. Thus, at the macro-level, the new National Accounts provide the underlying valuation base for a wide range of spin-off micro-level projects. Those geographic-specific applications, in which valuing nature's services takes on very practical dimensions, require the consistent and comparable reference point of the new National Accounts.

At the same time, however, this is by no means a one-way top-down relationship between macro and micro, in which the new National Accounts provide the only reference point for geographic-specific local applications. On the contrary, location-specific micro-projects and studies can help, particularly through extrapolation, to fill in data gaps at the macro-level, to test out the accuracy of the macro-valuations by concrete application in real circumstances, and through this feedback to modify and make the macro-level valuations much more precise than they would otherwise have been.

An example of this two-way relationship is the valuation that Dr. Costanza and David Batker conducted on the Louisiana-specific study of Hurricane Katrina impacts and losses, which in turn yielded important new valuations, which could be far more widely used and applied at a macro-level in the southern United States, of the estimated overall value of each hectare of wetland as protection against storms and hurricanes.

A second key challenge in setting up a PES system is that, in order to correctly attribute PES between beneficiaries and recipients, we have to be able to directly link certain actions with particular consequences. But often we cannot determine these scientific linkages with the required precision. For example, we do not have the scientific certainty that a certain action designed to improve conservation will actually yield particular desired outcomes, nor do we have the knowledge to determine the economic value of the changes that take place. In other words, a key challenge in considering possible PES measures is establishing those links between actions and consequences.

Effective modelling that is appropriate to particular needs and circumstances can go a certain way to predicting what consequences particular actions are likely to have. By feeding the known scientific data into the model, we can begin to predict that "x" amount of a particular input will likely produce a particular consequence of "y" magnitude.[72]

However, from a scientific point of view, we must acknowledge that uncertainties are often present and that we just do not know precisely the consequences of an action or intervention. In the light of such uncertainties we will want to put the burden of proof on those who stand to gain from the risks they engender. For example, mining companies should put up a bond to ensure against the risks of environmental degradation that might

result from their actions. If there is no pollution or environmental damage, they get back their bond. The burden of proof should not be on society at large, as is presently the case, nor on those who warn of potential damages based on existing evidence.

There are two key interlocking principles involved here, both of which are essential. The first is the *"polluter pay" principle*, which is an obvious policy consequence of natural capital and ecosystem service accounting work. The "polluter pay" principles effectively brings those natural capital valuations directly into the mainstream economic system and makes the market much more responsive to ecological signals than it is in our present, conventional accounting system, which treats environmental consequences as mere "externalities."

Second is the *precautionary principle* discussed earlier. Whenever there is a serious or potentially high risk of damage or degradation of nature's services, we err on the side of caution, and we may raise the insurance premiums, so to speak, to cover such potential risks.

Those two principles constitute the key accepted ways to deal with scientific uncertainties, particularly when the linkage between action and consequence may potentially be negative and result in damages to communities or to society at large. In sum, when we are uncertain about the linkage between an action and a potentially negative consequence, we err on the side of caution, and we assess a price that can cover potential risks — as in the example of the mining company bonds.

There is one other very important way to deal with such scientific uncertainties in the linkage between action and consequences, and that is quite simply to be completely transparent about those uncertainties. We acknowledge them openly, we make clear that we are drawing our conclusions tentatively based on the best scientific evidence presently available, and we are more than open to adjusting the values as new data and improved measurement methodologies become available. This is simple, transparent, and honest, and acknowledges the very real uncertainties that do exist in all such valuations.

As has been discussed, money is a very imperfect tool for assessing the value of non-market goods and services, and it is used only because it is a necessary strategy in this day and age to draw the attention of policy makers to highly valuable ecosystem services that are otherwise taken for granted, regarded as 'free', and inadequately protected, and whose depletion and degradation would otherwise remain invisible. But in using economic valuation, one also has to be careful not to make greater claims of precision and accuracy than are warranted by the actual evidence available.

None of these very real challenges constitute a case for ***not*** implementing PES systems or even for delaying implementation until uncertainties are resolved. It is important to remember that even the most imprecise and approximate natural capital and ecosystem service valuations are far more accurate than assigning an arbitrary value of zero, as conventional GDP-based accounting systems do, to non-market assets that have very real and tangible value.

Indeed the issue of PES would not even arise for consideration if the actual economic value of watershed and biodiversity protection, healthy forests, and fertile soils were not acknowledged. Safe and abundant drinking water, for example, has direct value for its beneficiaries, who also suffer direct losses when its quality is compromised. The fact that these vital non-market values are ignored and invisible in conventional GDP-based accounting mechanisms does not make them less real, nor does it make policy interventions designed for their protection less justifiable. Rather, it is the inadequacy of conventional accounting systems and the narrow market and growth-based economic paradigm they support that is revealed through such full-cost accounting analysis.

This reality leads to our final point here in discussing PES applications of Bhutan's new full-cost National Accounts. From an accounting point of view, it is most important to compare natural capital and ecosystem service valuations with GDP figures to point to the misleading signals currently sent to policy makers by conventional accounting systems and to demonstrate that the majority of the country's real wealth in fact derives from natural capital rather than from other assets.

This is clearly demonstrated by the initial basic value transfer valuation of Bhutan's ecosystem services, which shows they are annually worth about seven times as much as the nation's GDP. This comparison alone, released for the first time accompanying this prospectus as the first concrete contribution to Bhutan's new National Accounts, makes a robust case for the protection of this abundant natural wealth and thereby strengthen the case for implementation of effective PES systems without delay.

**Work sharing instead of unemployment**

Because full-cost accounts explicitly value free time, voluntary work time, and time spent raising children and doing household tasks — in addition to paid work — and because the accounts explicitly acknowledge and report the costs of time stress, they naturally and inevitably point policy makers towards solutions that enhance work-life and work-family balance.

By way of example, one potential policy application of the more comprehensive valuation of time in Bhutan's new National Accounts is considered here — namely the choice of job sharing as an alternative to job loss at times of economic downturn. The example is offered simply to illustrate that a broader accounting system that properly values social and human capital, and which assesses the full benefits and costs of policy alternatives, can suggest very practical policy options that are rarely on the agenda of governments reliant on conventional accounts.

As well, as this example indicates, the critique of the narrow economic growth dogma — a critique inherent in all aspects of the new full-cost National Accounts — naturally leads users to look beyond conventional assumptions that link employment solely to the business cycle. In fact, many studies provide considerable detail on employment creation and maintenance strategies that are independent of the business cycle, and that are particularly relevant to a time of economic downturn.

Such studies urge consideration of a redistribution of work hours and shorter work time solutions, in large part to reduce stress and enhance wellbeing and happiness, but also as an employment creation strategy. For example, the Netherlands successfully reduced unemployment from 12% in the early 1980s to less than 3% in 2001 in part through work redistribution strategies such as job-sharing and an increase in part-time work. In the Netherlands, by contrast to most other countries, part-time work is considered "good" work, as Dutch employer-labour agreements generally ensure equal hourly pay for part-time workers, along with pro-rated benefits, and equal opportunity for career advancement. That has made part-time work more attractive and provided Dutch workers with some of the shortest average work hours of any industrialized nation, while labour productivity improved substantially.[73]

As well, Dutch workers now have more time to spend with family and friends, contributing to their communities, and enjoying leisure pursuits, all of which in turn can enhance wellbeing and happiness. Such improved work-life balance will be clearly reflected in a system of National Accounts that assigns explicit value not only to paid work, as in GDP-based accounts, but also to leisure time, volunteer time, and unpaid child-care and household work.

The direct economic benefits of reduced work time options can also be seen when, in response to economic crises, some companies opt to reduce the work hours of their employees rather than lay them off. Typically, the manufacturing industry is disproportionately affected by business cycles and has participated more often in work sharing agreements than other industries. In Nova Scotia, Canada, Michelin responded to the 2008-09 economic downturn by offering a reduced work week to its employees in order to save the jobs of employees whose jobs were classified as "flexible" or contingent. Similarly, Stanfield's, a manufacturing company, opted to avoid layoffs by offering a work-sharing plan to hundreds of its employees who subsequently worked four days instead of five.[74] In these ways, work sharing can be used at times of economic downturn as a short-term strategy to avoid layoffs in firms, by reducing the number of hours worked by each employee. Such strategies not only avoid the pain and costs of unemployment noted earlier, but produce direct benefits for employers in maintaining skills and avoiding later costly re-hiring and re-training expenditures.

As part of such work sharing arrangements, some jurisdictions allow each employee to collect Employment Insurance (EI) benefits for part of the time not worked. For example, Germany has long used unemployment insurance benefits to pay workers on reduced schedules. The rationale is that instead of laying off 20 out of 100 employees, all 100 employees work 20% fewer hours each week, with each receiving EI benefits pro-rated for the time not worked. In this way, the same EI benefits that would have gone to the 20 laid-off employees are simply divided up among the 100, with no net gain or loss to government or the taxpayer. This form of work time reduction is seen as a temporary measure intended to prevent layoffs when there is a short-term reduction in the demand for labour.

In Canada, a Work Share Program was first introduced in l982. Under this scheme, there is usually no waiting period for EI benefits, and the shortage of work must be expected to last for at least six weeks to a maximum of 52 weeks.[75] Typically, after EI benefits, participating workers receive 20% more time off — often in the form of a 3-day weekend — in exchange

for less than a 10% cut in pay. Since workers still collect 90–92% of their former salary, this income-leisure trade-off can frequently be an attractive proposition. Thus, work share programs can also serve to enhance workers' quality of life through provision of more free time, family time, and time for community involvement in exchange for a manageable cut in pay.

Indeed, as an alternative to potential joblessness and job insecurity, workers facing potential layoffs generally welcome work sharing. The obvious benefit is that workers can avoid the substantial loss of income that accompanies job loss. Since work sharing produces a more equitable distribution of hours and income reduction, workers also avoid the loss of self-esteem, relative to their peers, that frequently accompanies layoffs, and produces social benefits in the form of greater equity and inclusion.

There are also substantial benefits to employers. Even though employers continue to incur fringe benefit costs for all the employees (even though they are now working fewer hours), the benefits have generally been found to far outweigh the costs. These benefits include:

- Productivity increases due to reduced absenteeism, high worker morale, and increased commitment to the job;
- The retention of valued and skilled employees;
- Improved labour relations;
- Reduced costs when demand increases, since there will be no need to hire and train new workers, who are generally less productive due to inexperience. These hiring and training costs can be substantial. Re-hiring of previously laid off workers — assuming they are still available — may also result in costs and productivity losses either from a deterioration in the skills of these workers during the lay-off period or from diminished morale.

Work time reduction strategies can be considered by the public and private sectors at all times, not just as a reaction to an economic downturn or reduction in demand. In the Scandinavian countries, the key issues in workplace decision making are often flexible and family-friendly work arrangements and more leisure time rather than wages. Thus in Thimphu, a more and more frequently heard complaint is the deterioration of family time and the decline in quality time spent by parents with children in dual-earner families — a complaint that might also be answered through reduced work time options and family-friendly work arrangements that enhance family and leisure time and wellbeing, and simultaneously create more job openings for those seeking work.

An excerpt from Dzongsar Khyentse Rinpoche's remarks cited above bears repeating here:

> Now let's look at family situations in cities like Thimphu. There we have the father working to support the family, but we also have the mother working, because extra income is needed since the house rents are so high. They also need to keep the bank accounts in balance…. Even when it comes to raising children, people living in the Thimphus and Phuentsholings of the world have no time for that. Everyone is just too busy trying to keep up with the others, trying to make that extra money. So children are growing up with no proper parental advice.

> …Now in Thimphu, during meal times, we have one son watching TV in his room, we have the daughter watching TV in her room, and the parents are still not home from work. These situations are all what we call the sufferings of modern famine. People are suffering like this because they are wealthy or trying to get wealthy. For me, this is not true wealth…. If we have material wealth with the aim of being happy, but we have the family structure all falling apart, then that's not happiness.

In sum, while the shorter work time and work sharing examples above are from industrialized countries like the Netherlands, Germany, and Canada, they are increasingly relevant to Bhutan as its citizens — particularly in urban areas — increasingly move towards and adopt the more materialist, consumerist lifestyles dominant in the west. By offering real leisure-income trade-offs through strategies such as work sharing, reduced work time options, and family-friendly work arrangements, policy makers in Bhutan too can avoid some of the social ills that accompany diminished family time and care, and can enhance wellbeing.

Since civil service jobs are so desperately sought after and in such short supply in Thimphu, voluntary work time reduction options offered to parents would also create more job openings for other young Bhutanese to fill the newly available hours. And instead of working full-time hours in those civil service jobs, parents might welcome shorter work days and longer vacations during the school holidays that allow them to spend more time with their children — an income-leisure trade-off that might significantly enhance family life and, in Rinpoche's words above, enhance "true wealth."

The available evidence clearly indicates that workers on shorter hours are not only far more productive during those hours but also schedule their personal appointments with doctors and other providers, during their personal time rather than during work hours. In these ways, there can also be significant productivity gains for the government and employers while enhancing the wellbeing of workers.

The literature on this subject also points to other work time strategies that can be considered by policy makers that would improve employee autonomy, morale, productivity, wellbeing, and happiness. In the civil service example above, government could amend current employment standards to give workers the right to voluntary work-time reductions with a proportionate reduction in pay without imperilling career advancement opportunities.

Also recommended in the literature based on experience, is that a wide range of work-reduction options be made available, including four-day work weeks, longer vacations, and shorter work days that allow parents to be at home when their children get home from school. Evidence indicates that the wider the range of work time reduction options, the higher the rate of voluntary take-up by employees.

The key point here is simply that such work-time options that have significant economic, human, family, and social benefits emerge naturally from full-benefit full-cost accounting mechanisms that value human and social capital alongside produced capital. Conversely, the policy options described above are inevitably sidelined in a materialist GDP-based economic system that only values paid work and the income it generates, which registers every increase

in work hours as economic gain, in which the costs of work stress and family breakdown are invisible, and in which assets like leisure, family time, unpaid household work, and voluntary contributions to community are unvalued.

As befits a holistic analysis, it must also be noted that natural capital and ecosystem benefits are not absent from such an analysis. As Anders Hayden convincingly demonstrates in his seminal book, *Sharing the Work, Sparing the Planet,* shorter work-time options that trade leisure for income will inevitably ameliorate the consumption habits that now make increasingly excessive demands on the world's finite and limited natural resources.[76]

Finally, equity considerations are inevitably part of such an analysis, since leisure-income trade-off options are presently only available to those with sufficient income to meet basic needs. Work-time reduction options for those with the means to trade income for leisure must therefore also be seen as a tool to make those extra hours available as employment and income generation opportunities for those presently with insufficient means to make ends meet.

In all, this simple example of work sharing and shorter work time options clearly illustrates not only how Bhutan's new National Accounts will be the foundation of a new wellbeing-enhancing economic paradigm, but how they will provide policy makers with the data and evidence they need to craft creative employment policies that are not currently on the agenda. Such work time policies will not only directly address practical current issues like family breakdown and related social ills, but — by effectively balancing social, human, economic, ecological, and equity needs and objectives — will strongly support the building of a true GNH society.

**Healthy food policy at schools**

While GDP-based measures of progress misleadingly count increased sickness costs — as reflected in higher spending on hospitals, doctors, and drugs — as economic gain and thus as contributions to prosperity and wellbeing, the new National Accounts will explicitly measure and value the health of the population as a contribution to true wellbeing and happiness, and will count higher sickness rates as a cost not gain to the economy. To that end, the new National Accounts will estimate the economic costs of chronic disease, alcoholism, tobacco use, physical inactivity, poverty, illiteracy, and other social determinants of health, and will highlight the cost-effectiveness of investments in health promotion.

Through such full-cost analyses of illness and risk factor costs, Bhutan's new National Accounts will be able to estimate the annual savings in excess, preventable health care costs that would be realized through a reduction in risk factors and consequent improvements in population health. Excellent and well-developed methodologies, based on robust epidemiological evidence linking risk factors to a range of chronic disease outcomes, now make it possible to assess the economic cost savings that could be realized through reductions in smoking, alcoholism, and obesity or through increased in physical activity.

By identifying cost-effective disease prevention interventions, such analyses also provide policy makers with the economic evidence they need to support health promotion initiatives. One example on child nutrition is provided here by way of illustration.

Policies to improve nutrition and health among children constitute a key component of a comprehensive population health promotion and disease prevention strategy. From a full-cost accounting perspective, such policies are also seen as investments in human capital. Such policies promote nutritional education in school curricula; provide tools for parents to help their children eat a balanced diet; establish appropriate pricing to ensure healthy food and beverages are accessible; involve students in planning menus; encourage children to bring healthy lunches and avoid processed food; and provide nutritious lunches for children who cannot afford to bring them.

In addition, a growing body of evidence points to the benefits of eating fresh, locally grown produce, and educating students and their parents about the benefits of organic food. Buying food that is grown and produced within Bhutan also supports Bhutanese agriculture and business and keeps more money in the community. For example, a class lesson might be devoted to exploring the economic, social, ecological, and nutritional benefits of spending 40 ngultrum on a bottle of pure, locally produced Bumthang apple juice compared to the hidden costs of the same expenditure on imported Coca-Cola. Students might also learn about hidden transportation costs, and find that fresh, locally grown food eaten shortly after harvest is generally more nutritious and has less hidden 'external' costs than chemically-grown food brought from a distance and eaten long after harvest.

In sum, the full-cost accounting perspective of Bhutan's new National Accounts has limitless practical policy applications from health promotion initiatives to school curriculum design. Put simply, a holistic, integrated approach to accounting and the economy will not only give policy makers far more accurate information on every front than the present narrow GDP-based accounts, but will give them the tools to craft policies that will bring GNH fully into the fabric of Bhutanese society and thereby enhance sustainability, wellbeing, and happiness.

- The economic value of civic and voluntary work
- Transportation accounts: What are the true costs of driving?
- Solid waste resource accounts
- Forest accounts
- Cost of work stress: Paid work hours and unemployment
- Cost of illness

## 5. Implementing full-cost accounting

In this chapter, we have provided examples of full-cost accounting methodologies from natural, human, and social capital realms. The six examples that follow serve to illustrate what full-cost accounting looks like in practice, how it is applied, and the type of results it produces. Because the valuation of non-market variables is complex, time and space limitations do not permit a comprehensive description of all the underlying assumptions and detailed methodologies used in full-costing accounting. However, the following case studies have been chosen to reflect different key points of interest in implementing full-cost accounting methods.

The following examples of full-cost accounting methods are necessarily highly condensed and are offered for illustrative purposes only. However, detailed step-by-step guidance on the methodologies used for each set of accounts is readily available in full-cost accounting studies that can be accessed on the Internet, or through expert help such as that offered by Dr. Costanza and the Institute for Sustainable Solutions. In addition, detailed explanations of cost calculations and methodologies, transparent descriptions of all assumptions, and explanations of technical factors like use of discount rates, can be found in the more than 100 volumes available for free download from the publications section of the GPI Atlantic website.[77]

### 5.1 The economic value of civic and voluntary work

The very term 'full-cost accounting' might seem to imply a focus on costs rather than benefits. But this is not the case. It is as important to focus on the benefits flowing from conservation of and investment in human, social, cultural, and natural capital as to measure the costs resulting from their depletion and degradation (depreciation). In fact, costs are frequently simply the consequence of taking for granted (and therefore failing to preserve) the un-priced value of ecosystem, social support, and other services that are assumed to be 'free'. To emphasize the importance of these often hidden values that are invisible in the

conventional economic accounts, a social capital example of valuing the benefits of key non-market services — in this case civic and voluntary work — is provided below.

Though motivated by generosity and care, civic activity and voluntary work also have a direct economic value. If such community service and voluntary work were suddenly withdrawn, either our standard of living and wellbeing would deteriorate markedly, or else government and the private sector would have to provide the lost services for pay. Particularly in an era of government fiscal restraint, we depend even more directly on the work of volunteers.

In addition, research has found that social networks — which voluntary work helps create — may play as important a role in protecting health, buffering against disease, and aiding recovery from illness as do behavioural and lifestyle choices such as quitting smoking, losing weight, and exercising. Indeed, the amount of voluntary work is often used as a proxy for determining the strength of social networks as a key non-medical determinant of health.

"Formal" voluntary activity describes unpaid work undertaken for charitable, non-profit, and community organizations like Tarayana, Youth Development Fund (YDF), or the Royal Society for the Protection of Nature (RSPN). "Informal" voluntary work is assistance given directly to individuals, not through any organization, such as cooking, cleaning, and doing farm chores or home repairs for a disabled, sick, or elderly neighbour. Since volunteer-based civil society organisations are mostly concentrated in urban centres, levels of formal voluntary work are always much higher in urban than in rural regions, and rates of informal voluntary work are usually considerably higher in rural areas.

Voluntary work, by definition, is always performed outside one's own home, while unpaid household work refers to work done within one's own home. So washing dishes for a sick neighbour is classified as informal voluntary work; washing dishes at an art show opening for a volunteer organization or at a tsok or other religious ceremony at a lhakhang is classified as formal voluntary work; and washing one's own dishes at home or those of a sick relative living in the same household is classified as unpaid household work — even though the activity itself is apparently the same.

Full-cost accounting of voluntary work generally uses data from general social and time use surveys, and unfortunately, is often not able to distinguish between formal and informal voluntary work. However, it inevitably finds that volunteers make significant contributions to national economies. The studies also inevitably find that it would be extremely costly for government to replace the work of volunteers with paying jobs in the market economy to provide the same level of services currently donated by volunteers.

In other words, a decline in voluntary work that is invisible in the conventional market-based economic statistics can be very costly if those 'free' services have to be replaced for pay. And if such services are simply not replaced, the lost volunteer hours can point to a significant decline in community wellbeing. As well, a strong voluntary-based civil society is a hallmark of a healthy democracy, providing opportunities for direct and regular civic participation far beyond the exercise of voting powers once every few years.

In sum, although volunteerism directly contributes to the economy social wellbeing, and good governance, we take it for granted and frequently fail to provide sufficient support for voluntary-based civil society organisations precisely because conventional accounting mechanisms give no value to voluntary work.

Bhutan's new National Accounts will remedy this serious omission by giving explicit value to the contribution of voluntary work in the country. Indeed, the first ever economic valuation of voluntary work in Bhutan is being released in February 2012 in tandem with this prospectus. The following section examines how such values can be estimated.

**Methodology used to calculate the value of voluntary work and monetary loss in voluntary services**

This methodology, which is based on a replacement cost valuation technique, is very simple, only requires a knowledge of basic mathematics, and uses existing time use survey data from the Centre for Bhutan Studies' GNH survey:

1. Establish the average time (minutes per day) spent on voluntary work per person aged 15 years and older, as provided in the CBS time use survey.

2. Multiply by 365 and divide by 60 to get total average volunteer hours per year per person aged 15 years and older, as derived from the daily numbers of volunteer minutes in the CBS time use survey.

3. Multiply the total average volunteer hours per year per person by the Bhutanese population aged 15 and over to get the total volunteer hours given by all volunteers within the population aged 15 years and older.

4. Multiply this product by the average hourly wage or by a wage at the low end of the wage scale (replacement cost methodology). This yields a conservative estimate for the total annual economic value of voluntary work in Bhutan based on what it would cost to replace those services in the market economy.

   In the separate accompanying report on the value of voluntary work in Bhutan, we have used a replacement cost value of Nu. 165 a day, which is the lowest (category 5) wage for the national work force in Bhutan. This amounts to Nu. 25.38 an hour based on an average 6.5 hour working day, as advised by researchers at the Centre for Bhutan Studies.

   A more precise method for calculating replacement cost values for voluntary work, if data were available, would be to distinguish "specialist" from "generalist" replacement cost values. Such a distinction would produce a considerably higher estimate for the economic value of voluntary work in Bhutan than the one provided in the accompanying report on that subject.

   The *specialist replacement value* of voluntary work can be estimated by looking at the market value of the type of work that volunteers actually do in the *formal* volunteer sector, rather than by the average low-end market wage that we have used. For example, the

contribution of the volunteer treasurer of the Board of Directors of a civil society organisation (CSO) like Tarayana in making budgets, keeping accounts, and preparing the CSO books for audit by the Royal Audit Authority would be calculated by how much it would cost to pay for those accounting services in the market economy. That 'specialist' service would cost considerably more to replace, for example, than someone cleaning up after a community event.

Such 'specialist cost replacement values' for formal volunteer work can only be estimated on the basis of an actual survey and study of voluntary-based civil society organisations in Bhutan to assess the work that these volunteers actually perform. Such a study does not yet exist.

By contrast to such formal voluntary work done through established CSOs, voluntary work done *informally* is often of the domestic variety, e.g. cooking, cleaning, or shopping for a sick neighbour, helping with farm chores, etc. This informal voluntary work often requires less skill or expertise than the formal volunteer work offered through organisations, so it is usually valued at a lower rate of pay. In other words, such informal voluntary work would cost less to replace in the market economy than, say, the volunteer treasurer of a board of directors as described above.

Thus, informal voluntary work is often valued at what is called the *generalist replacement value* that is also used to value unpaid household work. This 'generalist replacement value' often approximates the market value of domestic labour like housecleaning services or paid child care, which constitutes a considerable portion of the informal voluntary work offered directly to sick, elderly, or disabled individuals in need of help. The hourly generalist replacement cost value is clearly always considerably less than the hourly specialist replacement value.

Since data are not yet available in Bhutan to apply different hourly pay scales to the formal and informal voluntary sectors according to specialist and generalist replacement values respectively, we have used the Nu. 25.38 / hour value for *all* voluntary work in Bhutan.

To be even more conservative, we could have used the minimum wage of Nu 100 per day, or just Nu. 12.5 per hour based on an 8-hourwork day for all voluntary work.[78] However, investigations indicated that use of this minimum wage would have very severely underestimated the actual value of voluntary work in Bhutan, and is also contrary to explicit advice in the United Nations Statistics Division's *United Nations Handbook on Non-Profit Institutions in the System of National Accounts*, and we therefore used the Nu. 25.38 / hour value as the closest approximation of a conservative replacement value that might be applied to the voluntary sector as a whole (formal and informal combined.).

It should be noted that such replacement cost values should always be expressed in the ngultrum/rupee value in the year of the survey on which the primary data are based. Therefore, if the data are for 2010, as is the case with the latest CBS time use survey data, then the ngultrum (rupee) value needs to be adjusted to 2010 ngultrum (rupee) values using the Consumer Price Index.

Unpaid work valuations using replacement cost methodologies as outlined above inevitably underestimate the actual value of the services performed by volunteers. In the market economy, and in GDP valuations, the value of those services is determined not only by labour inputs (as we are doing here) but also by capital and other inputs. Indeed, GDP can grow even with job losses if productivity gains result from capital and technology improvements.

If data were available, therefore, a more accurate way of valuing the services performed by volunteers, and one more comparable to GDP values, would therefore be to value "outputs" rather than just one key input (albeit a major one) — namely labour. Despite promising work undertaken at the United Nations, by the International Association for Time Use Research, and others, data limitations and methodological obstacles do not presently allow such output valuations for unpaid work here.

Other potential valuation methodologies include "opportunity cost" valuations where, instead of measuring the replacement value of voluntary work for performance of the same services in the market economy, we instead use the profile of volunteers themselves to look at what they would be earning in their regular jobs if they put in the same number of hours in those jobs as they are currently contributing in the voluntary sector.

Studies show that opportunity cost values yield considerably higher valuations than replacement cost values, primarily because many volunteers are highly skilled, educated, and socially committed individuals, and also simply because most earn a lot more on an hourly basis than the low Nu 25.38 hourly rate used in our replacement cost valuation (which amounts to only about Nu 4,000 a month).

Far more detailed analyses and correlations of the CBS time use data with other socio-demographic and living standard sections of the GNH survey would allow for development of such a detailed profile of Bhutan's volunteers, including their location, their age, gender, education, and experience, their present work and income, and other key characteristics. That profile in turn could be used to develop opportunity cost estimates for the value of voluntary work in Bhutan.

Finally, one way of at least beginning to approximate the output value of the services that volunteers perform would be to conduct a very short survey of a reasonable sample of volunteers to assess what other inputs (aside from labour) are contributed in the performance of their work. For example, volunteers generally incur out-of-pocket expenses in the performance of their voluntary duties, such as the cost of transportation to get to meetings and assignments, equipment, materials, supplies, and sometimes even uniforms as volunteering at hospitals or clinics or in sports coaching may require. Adding such out-of-pocket expenses to labour input values would at least partially reduce the current underestimate based on using replacement cost valuations alone.

In sum, a range of further exploratory and research steps can be undertaken to produce ever more accurate and detailed estimates of the value of voluntary work in Bhutan. Including such valuations in the National Accounts provides the impetus required to study and understand the voluntary sector in the same depth and detail that we now devote to any

other sector of the economy, such as manufacturing, farming, teaching, and tourism. So long as voluntary work remains unvalued, it receives inadequate attention and support in the policy arena. In a GNH society, valuing voluntary work is particularly important, as it makes a very significant contribution not only to Bhutan's economy but also to the health and wellbeing of communities, children and disadvantaged groups, the environment, spiritual and cultural life, and society at large.

In addition to the basic economic valuation of voluntary work described above, there are many further spin-off valuations and explorations that may be undertaken to provide even more detailed information to policy makers. For example, socio-demographic breakdowns of the voluntary sector, and research on the types of work volunteers do, the challenges they face, the relationship between the paid staff of CSOs and volunteers, and much more can help us understand this important sector better. For illustrative purposes, two examples for additional important valuations are briefly outlined here.

5. The calculations in the first four steps above assess the hours and value of voluntary work from the perspective of the volunteers themselves — i.e. how many hours are they putting in and what is the value of their time? This produces an understanding of the voluntary sector from the side of those *giving* voluntary services. However, it is also possible to use existing CBS GNH survey time use data to assess the contribution and value of voluntary work from the perspective of the population at large — i.e. reflecting those *receiving* voluntary services.

   The first step in that process is to divide the product of step 3 (total volunteer hours *given* by all volunteers within the population 15 years and older) by the *total population* (all ages) to get hours of voluntary services per capita. The reason to divide by the whole population is that some of the recipients of voluntary services (e.g. services offered at schools or in youth groups) are children. This per capita figure represents the *rate* at which voluntary services are *received* by the population at large.

6. In order to understand whether or not voluntary service hours have increased or decreased since a certain year, and what the economic value of that gain or loss might be, we need to know the number of voluntary service hours per capita for each of the years under comparison. For that we need time series data than are not currently available, but which *will* become available with the next CBS GNH survey.

   Once those comparative results are available, as they will be in the next GNH survey, we can then answer questions like: Had voluntary service hours per capita in 2013 been offered at the same rate as in 2010, how many hours would have been offered? And what gain or loss to the economy and society of Bhutan does that result represent when compared with the actual 2013 voluntary service hours?

   To undertake this investigation, we would first take the voluntary service hours per capita in 2010 and multiply that number by the total population in 2013. This gives the number of voluntary hours that would have been offered in 2013 had voluntary services been offered at the same rate in 2013 as in 2010.

6a. We then multiply that result by the hourly replacement cost of voluntary work as described in Step 4 above. Since we are here intent on comparing the economic value of voluntary work hours in two separate years, we must take care here to choose to adjust the values for inflation using the Consumer Price Index, and thus expressing both 2010 and 2013 monetary values in either 2010 ngultrum *or* 2013 ngultrum. In other words Nu 25.38/hour in 2010 will be higher in 2013 due to inflation between 2010 and 2013.

6b. The next step in this comparison is to subtract the total number of voluntary hours *actually* offered in 2013 (calculated just as described in Step 3 above) from the result of Step 6 above (which is the number of voluntary hours that would have been offered had voluntary services been offered at the same rate in 2013 as in 2010). The difference is the gain or loss in voluntary services actually *experienced* ***by*** the Bhutanese population.

Bear in mind that in this exercise we are looking at voluntary service hours from the perspective of recipients rather than givers to assess gains or losses in actual services received, and strengthening or weakening of Bhutan's civil society and voluntary sectors. That is why this particular analysis must account for Bhutan's population increase between 2010 and 2013, in order to assess whether the level of voluntary services (as assessed by hours given and received) is keeping pace with population gains.

6c. To get the monetary value of that 2013 gain or loss in voluntary services compared to the 2010 voluntary service rate, we can then either a) multiply the result of Step 6b by the hourly replacement cost, or b) subtract the result of Step 4 from the result of Step 6a above.

These additional example calculations are given here simply to illustrate the potential scope and policy utility of (a) such economic valuation exercises and (b) a deeper analysis and understanding of the voluntary sector altogether. Even minimal basic but vitally important data, as provided by the CBS GNH time use survey, are readily translatable into economic valuation terms in Bhutan's new National Accounts. Most importantly, these data open the gateway to a far greater appreciation of the vital productive value and social benefit of unpaid work contributions than is possible from current market-based GDP accounting mechanisms that ignore such important unpaid work contributions and thereby devalue them and render them invisible.

## 5.2 Transportation accounts: What are the true costs of driving?

As the number of vehicles on Bhutanese roads (and especially in Thimphu) escalates exponentially, a study on the full costs of driving seems more urgent than ever in order to direct policy towards sustainable transportation and land use planning before it is too late. In this case, just as with the basic value transfer methodology used to undertake the first ever economic valuation of Bhutan's ecosystem services being released in February 2012 alongside this prospectus, there is no obstacle to using such extrapolations to come up with fairly quick initial estimates of the full costs of private automobile transportation in Thimphu and in Bhutan.

It is therefore important to note here that in the methodological description that follows, and especially in the suggested inventory of transportation costs listed in Table 3 below, we are not assuming direct data availability for Bhutan, but assuming that initial estimates for Thimphu and Bhutan will extrapolate many such costs on a per vehicle kilometre basis from comparable studies undertaken in other jurisdictions, adjusting those results to the degree possible to local conditions. Gradually, over time, as Bhutan-specific data are collected and become available, the 23 cost estimates outlined in Table 3 below, can be refined for more accurate estimates and precise analyses in the future. Nonetheless, the urgency of sustainable transportation planning in Bhutan calls for the best initial estimate, based on the most comparable data sets elsewhere, to be derived as soon as possible.

The following is a summary of transportation full-cost accounting methodology, which includes many key costs of driving of which drivers are typically unaware. To illustrate the differences between different types of transportation costs, the private passenger transportation costs can be divided into three basic categories:

**1. Internal variable costs**
These are direct costs borne by the driver, which vary according to conditions, vehicle type, and how much a person drives. Examples are vehicle operating costs (like petrol and repairs) and travel time.

**2. Internal fixed costs**
These are direct costs borne by the driver, which do not really change when driving habits and conditions change. These generally include vehicle ownership costs (car payments), registration, insurance, and any fixed parking fees associated with residence and work.

**3. External costs**
These are the uncompensated effects an activity poses on other individuals or on society at large. These include, for example, costs imposed by drivers on others, such as climate change and air pollution damages, congestion, noise, publicly-funded accident costs (such as medical and hospital costs), traffic policing expenditures, and parking subsidies to drivers, the cost of which is passed on to other citizens.

Since individual drivers do not bear these external costs directly as actual out-of-pocket expenses, they tend to undervalue these impacts when making a particular trip in a vehicle. For example, when parking facilities are subsidized (including in the opportunity cost of land dedicated to parking that could otherwise be producing rental income), drivers will tend to rely less on alternative modes of transport than if high parking costs were borne directly by users.

Both economic efficiency and genuine sustainable transportation planning require that externalities be internalized so that prices reflect the full marginal costs of producing that good or service, unless a subsidy is justified for societal reasons.

**Direct/Indirect costs**
Alternatively, costs can be classified simply as either direct or indirect, based on either objective criteria or subjective experience. If, in the above example, an employer, government agency, or business subsidizes parking for driving employees or customers,

those additional direct government or employer-borne costs may be passed on to *all* citizens, employees, or customers, which in turn indirectly favours drivers over non-drivers. In its own work, GPI Atlantic has found the internal variable/ internal fixed/ external classification of costs described above to be clearer and more useful than the seemingly more simple direct/ indirect cost breakdown.

It should be noted that there are many non-market external costs associated with transportation for which money is a poor valuation tool. In addition, some monetization techniques are quite complex. As well, raw data and physical information on many of these transport-related costs are currently limited, for example, in the case of transport-related water pollution. As well, the transport-attributable portion of some costs like resource externalities may be challenging to determine with precision.

Despite such methodological and data challenges, the non-market effects of economic activity, including transportation, are no less real than many of the costs that are conventionally counted. Quantifying these costs to the extent possible at least allows them to receive the attention they deserve in policy analysis. And at least using the best available data and methodologies to produce the best possible estimates, however imprecise they may be, is still far more accurate than assigning such real non-market costs an arbitrary value of zero, which is certainly wrong, as in conventional GDP-based accounts.

The Victoria Transport Policy Institute's (VTPI) pioneering work on full-cost accounting for transportation can provide a good template for valuation work for this component of Bhutan's new National Accounts. VTPI has provided an online 500-page guide, which is regularly revised and updated, for quantifying the full costs and benefits of different modes of transportation and applying this information to policy analysis and planning. The guide, titled *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications,* may be downloaded from the VTPI website by chapter at no cost, and is likely the single easiest and most straightforward and comprehensive database for an initial basic value transfer estimate of driving costs in Bhutan.[79]

Based on a wide-ranging review of the literature on transportation costing studies, the VTPI derived the generic cost values for each of 23 transportation impacts for 11 different modes of passenger transportation. Because these values are presented on a per-vehicle-kilometre basis, they can be readily extrapolated for other jurisdictions, including Thimphu and Bhutan, simply by knowing the number of vehicle kilometres driven annually here — figures that are readily available. Adjustments to local conditions, such as differential land values, wages, and hospital/ medical costs, can also be readily undertaken. As well, there is no obstacle to an initial transport cost study omitting some of the 23 categories listed below for which present estimates are considered too unreliable.

Table 3 below itemizes the 23 transportation cost categories recommended by VTPI for full-cost accounting transportation studies, and provides a basic definition of each.

**Table 3. Transport cost categories**

| Cost | Description |
|---|---|
| 1. Vehicle ownership | Fixed costs of owning a vehicle. |
| 2. Vehicle operation | Variable vehicle costs, including fuel, oil, tires, tolls and short-term parking fees. |
| 3. Operating subsidies | Financial subsidies for public transit services. |
| 4. Travel time | The value of time used for travel. |
| 5. Internal crash | Crash costs borne directly by travellers. |
| 6. External crash | Crash costs a traveller imposes on others. |
| 7. Internal activity benefits | Health benefits of active transportation (e.g. walking, bicycling) to travellers (a cost where foregone). |
| 8. External activity benefits | Health benefits of active transportation to society (a cost where foregone). |
| 9. Internal parking | Off-street residential parking and long-term leased parking paid by users. |
| 10. External parking | Off-street parking costs not borne directly by users. |
| 11. Congestion | Congestion costs imposed on other road users. |
| 12. Road facilities | Roadway facility construction and operating expenses not paid by user fees. |
| 13. Roadway land value | The value of land used in public road rights-of-way. |
| 14. Traffic services | Costs of providing traffic services such as traffic policing, and emergency services. |
| 15. Transport diversity | The value to society of a diverse transport system, particularly for non-drivers. |
| 16. Air pollution | Cost of vehicle air pollutant emissions. |
| 17. Greenhouse gas pollution | Lifecycle costs of greenhouse gases that contribute to climate change. |
| 18. Noise | Cost of vehicle noise pollution emissions. |
| 19. Resource externalities | External costs of resource consumption, particularly petroleum. |
| 20. Barrier effect | Delays that roads and traffic cause to non-motorised travel. |
| 21. Land use impacts | Increased costs of sprawled, automobile-oriented land use. |
| 22. Water pollution | Water pollution and hydrologic impacts caused by transport facilities and vehicles. |
| 23. Waste disposal | External costs associated with disposal of vehicle wastes. |

Source: Litman, Todd Alexander with Eric Doherty. 2011. "Executive Summary", *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications.* 2nd edition. Victoria Transport Policy Institute. Available at http://www.vtpi.org/tca/tca00.pdf. Accessed November 2011.

Table 4 below provides a list of the 11 transport modes and their descriptions for which VTPI provides cost estimates. The modes include various forms of automobile use and public transit, as well as walking, bicycling, and telecommuting. However, some of these transport modes, such as "electric bus/trolley," do not apply to Bhutan, and can therefore clearly be omitted in any initial transport cost study for Bhutan extrapolated from the VTPI database. Also, there are very few "electric cars" in Bhutan at the moment, but since these

are beginning to become available, the number of small electric cars in Bhutan is apt to grow fairly quickly according to current predictions.[80]

Data limitations might also preclude using the "walking, cycling, and telecommuting" categories in an initial accounting analysis, which might therefore be confined primarily to a first estimate of private vehicle driving costs. Also, please note that the VTPI's mpg (miles per gallon) estimates below must be translated into kilometres per litre for local analysis, and other estimates like average bus occupancy, and average length of commute trip must also be adjusted for local conditions.

**Table 4. Transport Modes**

| Mode | Description |
|---|---|
| Average Automobile | A medium sized car that averages 21 mpg overall (16 mpg city driving, 24 mpg highway driving), averaging 1.5 overall and 1.1 urban-peak occupancy. |
| Compact (Fuel Efficient) Car | A small four passenger car that averages 40 mpg overall (34 mpg city driving, 46 mpg highway driving). |
| Electric Car | A medium size electric car that averages 0.5 kWh per mile fuel efficiency. |
| Van or Light Truck | A van, light truck, or sport utility vehicle that averages 15 mpg overall (14 mpg city and 20 mph highway driving). Occupancy is same as an automobile. |
| Rideshare Passenger | The incremental cost of an additional passenger. |
| Diesel Bus | A 40-foot bus with 25 peak and 8 off-peak passengers, averaging 4.0 mpg. |
| Electric Bus/Trolley | A 65-passenger bus or trolley with 30 peak and 10 off-peak passengers, averaging 6.5 mpg energy consumption equivalent. |
| Motorcycle | A medium size motorcycle with 45 mpg urban and 55 mph rural average fuel efficiency. |
| Bicycle | A moderate priced bicycle ridden at an average of 10 mph. |
| Walk | A person walking at an average of 3 mph. |
| Telework | Two 11-mile commute trips avoided on each day that employees work from home. |

Source: Litman, Todd Alexander with Eric Doherty. 2011. "Executive Summary", *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications.* 2nd edition. Victoria Transport Policy Institute. Available at http://www.vtpi.org/tca/tca00.pdf. Accessed November 2011.

In the beginning because of data limitations, as noted, the transportation component of Bhutan's new National Accounts need not include all of the 23 transportation impacts for all of the transportation modes that are relevant to Bhutan. As with all of parts of the new National Accounts, the transportation component can expand in future updates of the National Accounts as more data become available.

In the meantime, again as noted above, it should be possible to rely on VTPI cost values and extrapolate them to Bhutan's conditions. As noted, VTPI has developed "generic" cost values based on an analysis of numerous studies undertaken throughout North America, and

in some cases, in other parts of the world. VTPI recommends using and adjusting these values as appropriate to reflect specific regional and local circumstances more accurately. For example, vehicle operating cost values should be adjusted to reflect current fuel costs in the jurisdiction under study, and parking costs should be adjusted to reflect prevailing land and property values and construction costs in the area.

As noted, costs are expressed by VPTI on a per vehicle-kilometre basis (or on a per passenger-kilometre basis where appropriate) to allow aggregation using a common metric and comparison between cost estimates for different impacts. For most of the cost categories, in order to derive the total cost estimates for each mode and each impact in Bhutan, the generic VTPI per vehicle-kilometre estimates can be multiplied by the estimated number of kilometres travelled annually within Bhutan by each of the passenger transportation modes used in the transportation accounts, making adjustments to local values and conditions as needed.

Cost totals for each modal category can then be summed to assess the total cost of each transport-related impact (congestion, traffic services, noise, etc.) attributable to motor vehicle passenger transportation in the nation. The cost totals can then be divided by the Bhutanese population in order to assess per capita transportation costs by mode per year. The estimates can also be used to assess the full costs of driving on a per automobile basis, based on numbers of kilometres driven per year, and the "external" amount and proportion of those costs imposed by drivers on the rest of Bhutanese society.

The VTPI costing framework primarily reflects passenger travel and does not include a complete set of freight transport cost values. While many of the default costs are transferable to freight transport, some adjustment is needed, and some of the key data needed for a proper analysis of freight transport may be missing. For example, without data for tonne-kilometres of goods moved by air and road transport and specific freight transport cost values, it is not possible to calculate overall freight costs in the country.

Future development of such a freight transport cost analysis which should include the cost of greenhouse gas and air pollutant emissions attributable to freight transport in Bhutan, is particularly relevant to issues like enhancing food self-sufficiency and reducing reliance on imports. When full freight transport costs are considered, the cost of many imported foods and goods would be considerably higher than those locally produced and transported over far shorter distances. This is clearly not currently the case. In fact, current trends indicate increased reliance on imports, which is furthered through the market distortions that occur when full transport costs are excluded from conventional accounting mechanisms. The freight transport component of Bhutan's new full-cost National Accounts will eventually be able to rectify such distortions.

Not all initial passenger transportation cost estimates need to be extrapolated from VTPI estimates. In some cases, direct local data are currently available. In accounting for the cost of automobile crashes, for example, actual numbers of road transportation injuries and fatalities in Bhutan can be used as the basis for such cost estimates with no need to rely on extrapolation from external data sources.

These direct, primary road accident statistics can then be monetized by using the costing methodologies used in traffic safety studies, as described by VTPI, with adjustments for the actual costs of hospitalization and medical care in Bhutan, and with the cost of productivity losses adjusted to local wage rates.

A focus on costs is not intended to ignore transportation benefits, and a comprehensive monetization of benefits is possible if appropriate data are available. At the same time, cost analysis is often the basis for quantifying incremental benefits, and so a new National Accounts transportation cost analysis may be seen as a necessary first step towards a full benefit-cost analysis. For example, benefits such as improved mobility are often measured in terms of travel-time cost savings, and improved safety can be measured based on reduced crash costs.

As well, some benefits can be assessed in terms of avoided costs, just as foregone benefits can be considered costs. For example, walking to work two days a week instead of driving produces both direct health benefits and also indirect societal benefits in avoided greenhouse gas emissions and climate change and air pollutant damage costs. Conversely driving produces indirect costs in foregone health benefits and direct costs in air pollution and greenhouse gas emissions. In other words, a costing analysis by no means ignores all benefits, which can often be assessed in direct relation to costs.

In general, transportation provides many mobility-related benefits to users and society that cannot all be quantified due to major conceptual and methodological challenges, and in total these benefits are enormous. However, the evidence also demonstrates that, beyond a certain optimal level, additional mobility provides declining and eventually negative marginal benefits. As a result, the greatest benefits to society may result from policies that increase transportation system efficiency and so reduce total vehicle travel.

From that perspective, a transportation costing analysis should by no means be seen as denying transportation benefits but rather as providing information that allows efficiency and cost-reduction improvements on the *margins*. In other words, in a case like driving, they can demonstrate where further increases or declines in automobile use will produce marginal concomitant cost and benefit increases or declines.

Studies have also shown that *non-automobile* transportation services tend to provide special types of benefits, such as:

- *Mobility and accessibility benefits*: benefits that result when improved and more diverse transportation options allow people who are physically or economically disadvantaged to travel more and access more services and activities.
- *Efficiency and cost reduction benefits*: benefits that result when improved transportation options allow people to shift travel to more efficient and affordable modes.
- *Fitness and public health benefits*: benefits that result when more people are able to achieve the level of physical activity required for basic health (20–30 minutes a day of moderate physical activity, such as walking or cycling).

This categorization of non-automobile transportation service benefits indicates the types of benefits that can be demonstrated by a costing analysis. In other words, there are many ways in which a comparative assessment of costs and potential cost reductions by transport mode can point to the benefits attributable to particular types of transportation. In these ways, a costing analysis does not exclude consideration of a wide range of transportation benefits.

The power and policy relevance of these cost estimates can be seen when looking closely at each cost, since each has the potential to point to financial incentives and penalties rewarding sustainable behaviour and penalizing unsustainable behaviour, and may be the basis of effective road pricing policies. For example, in London, England, congestion costs have been translated into policy and into a significant congestion tax that has kept cars out of central London and markedly improved both air quality and traffic flow — a perfect example of how pricing mechanisms can be used to change behaviour. It is also an example of how an avoided cost becomes a tangible benefit. In such a case, the cost of congestion can potentially be used to determine the dollar amount of a congestion tax.

Each cost has its own assumptions, with the accounts almost naturally producing highly conservative estimates, since they generally only count what can be quantified and therefore omit a wide range of less measurable costs. For example, congestion cost estimates generally count only lost time, excess petrol burned, and excess greenhouse gases generated, but are generally not able to assess the health costs of breathing in the fumes of idling cars stuck in traffic jams. Also, some congestion cost studies have only been able to estimate recurrent congestion occurring on major arteries during the morning and late afternoon rush hours, for example, between 7am and 9am and between 4pm and 6pm — not at any other time of day or attributable to any other cause (snowstorms, accidents, road works, etc.). Most congestion cost studies have also included only passenger transportation costs, not costs to business attributable to freight delays, and so on.

This example of congestion cost estimates — which constitute a very small portion of total driving costs — also indicates that accounts may be developed with minimal data to start with. Including even a small proportion of total costs, as in this example, is still far more accurate than ignoring such congestion costs entirely, as in the conventional GDP-based accounts, which in fact perversely count the costs of increased petrol consumption due to congestion as contributions to economic growth.

The example also illustrates the kind of assumptions and exclusions built into each cost calculation, and indicates the propensity to err on the side of conservatism — which is essential in introducing a new accounting system in order not to discredit it through possible exaggeration.

After each transport cost (operating costs, parking, air pollution, congestion, etc.) is separately assessed based on the kinds of considerations illustrated above, all costs can then be summed to estimate total transportation costs for each transport mode under consideration. Per capita costs by mode of transport can also be compared to assess the comparative efficiency of travel by different modes. Average road passenger transportation costs (per vehicle-km) can also be ranked by magnitude to indicate the aggregate distribution of costs for an average car. Generally, it has been found that about 39% of automobile costs are internal variable costs, 28% are internal fixed costs, and 33% are external costs (imposed

by drivers on society and excluded from current consideration in conventional accounting mechanisms).
As noted above, the transport cost categories are divided into three categories: *internal-variable* (costs borne directly by users according to how much they drive), *internal-fixed* (costs borne directly by users, but not significantly affected by how much a motorist drives), and *external* (costs imposed on others). In general, economists tend to consider costs that are fixed or external as *inefficient* (where efficiency requires that prices equal or at least amply reflect marginal costs), and costs that are external as *inequitable* (in that users should bear the full costs resulting from their consumption decisions, unless a subsidy is explicitly justified for demonstrable societal benefit). In fact, it is externalities that often conceal the full costs of private vehicle use to society. Transportation accounts provide the basis for potential road pricing policies that may eventually ensure that driving pays its true costs, which will in turn improve the efficiency of the transportation system as a whole.

Transportation cost results can identify a variety of problems and unsustainable trends — such as that the transportation system is distorted in various ways that result in economically excessive motor vehicle travel (that is, more motor vehicle travel than would occur in an efficient market), which in turn is harmful in a number of ways. However, there is actually a very positive message that emerges from this type of evidence and particularly from the identification and compilation of full transportation costs. That message is that market reforms which correct existing distortions can provide a wide range of economic, social, and environmental benefits that will enhance wellbeing, produce cost-savings, improve environmental quality, and boost long-term prosperity.

For example, improved walking and cycling conditions, improved public transit services, and more efficient road pricing can help reduce traffic congestion, road and parking facility costs, consumer costs, accident risk, energy consumption, and pollution emissions, while improving public fitness and health, increasing beneficial economic activity, supporting strategic land use objectives (such as reducing sprawl), and even supporting specific objectives such as urban redevelopment, tourism activities, and heritage preservation.

A wide range of tested and proven policy and planning reforms can help provide such benefits. Many of these are discussed in VTPI's *Win-Win Transportation Solutions: Mobility Management Strategies that Provide Economic, Social and Environmental Benefits*.[81] Table 5 below lists examples of these strategies and reforms in summary form. Each of these options has been described in detail in the literature, along with concrete examples of existing best practices.

These reforms have been dubbed "Win-Win Transportation Solutions" because each intervention achieves multiple benefits across economic, social, and environmental dimensions. They are cost-effective and technically feasible market reforms that help solve transportation problems by increasing consumer options and removing market distortions that encourage inefficient travel behaviour. Although their individual impacts may appear modest, their combined benefits can be substantial.

Thus, if fully implemented to the degree that is economically justified, Win-Win Solutions, such as those outlined in Table 5 below, can provide very significant total benefits. They are "no regrets" measures that are justified regardless of uncertainties about global warming or other environmental and social impacts. They therefore represent true sustainability

strategies, as opposed to strategies that may help address one or two planning objectives while exacerbating other problems by increasing total motor vehicle travel and sprawl. Such proven win-win solutions and policy and planning reforms, which have been tried and tested in many jurisdictions, are very good news for the Kingdom of Bhutan. Not only does Bhutan not to have to fall into the same automobile-dependent development traps that have led to environmental degradation, sprawl, and community disintegration throughout the industrialized world, but such reforms are fully consonant with Bhutan's GNH development philosophy. By definition, win-win solutions are holistic approaches that simultaneously address social, economic, and environmental objectives in line with the integrated GNH approach to development.

Those win-win solutions in other jurisdictions were often developed by 'learning the hard way', and as belated attempts to reverse car-dependent development that had already produced enormous damage. Despite a worrying increase in automobile dependency, Bhutan still has the opportunity to avoid the same costly errors of other countries, and instead to implement highly sustainable and efficient transportation solutions in line with GNH principles, and based on best practices elsewhere. The transportation component of Bhutan's new National Accounts can provide extraordinarily useful information to policy makers considering such options.

## Table 5. Examples of Win–Win Strategies

| Strategy Name | Description | Transport Impacts |
|---|---|---|
| Least-Cost Planning | More comprehensive and neutral planning and investment practices. | Increases investment and support for alternative modes and mobility management, improving transport options. |
| Mobility Management Programs | Local and regional programs that support and courage use of alternative modes. | Increases use of alternative modes. |
| Commute Trip Reduction (CTR) | Programs by employers to encourage alternative commute options. | Reduces automobile commute travel. |
| Commuter Financial Incentives | Offers commuters financial incentives for using alternative modes. | Encourages use of alternative commute modes. |
| Fuel Taxes - Tax Shifting | Increases fuel taxes and other vehicle taxes. | Reduces vehicle fuel consumption and mileage. |
| Pay-As-You-Drive Pricing | Converts fixed vehicle charges into mileage-based fees. | Reduces vehicle mileage. |
| Road Pricing | Charges users directly for road use, with rates that reflect costs imposed. | Reduces vehicle mileage, particularly under congested conditions. |
| Parking Management | Various strategies that result in more efficient use of parking facilities. | Reduces parking demand and facility costs, and encourages use of alternative modes. |
| Parking Pricing | Charges users directly for parking facility use, often with variable rates. | Reduces parking demand and facility costs, and encourages use of alternative modes. |
| Transit and Rideshare Improvements | Improves transit and rideshare services. | Increases transit use, vanpooling and carpooling. |
| HOV Priority | Improves transit and rideshare speed and convenience. | Increases transit and rideshare use, particularly in congested conditions. |
| Walking and Cycling Improvements | Improves walking and cycling conditions. | Encourages use of nonmotorized modes, and supports transit and smart growth. |
| Smart Growth Policies | More accessible, multi-modal land use development patterns. | Reduces automobile use and trip distances, and increases use of alternative modes. |
| Location Efficient Housing and Mortgages | Encourage businesses and households to choose more accessible locations. | Reduces automobile use and trip distances, and increases use of alternative modes. |
| Mobility Management Marketing | Improved information and encouragement for transport options. | Encourages shifts to alternative modes. |
| Freight Transport Management | Encourage businesses to use more efficient transportation options. | Reduces truck transport. |
| School and Campus Trip Management | Encourage parents and students to use alternative modes for school commutes. | Reduces driving and increases use of alternative modes by parents and children. |
| Regulatory Reforms | Reduced barriers to transportation and land use innovations. | Improves travel options. |
| Carsharing | Vehicle rental services that substitute for private automobile ownership. | Reduces automobile ownership and use. |
| Traffic Calming and Traffic Management | Roadway designs that reduce vehicle traffic volumes and speeds. | Reduces driving, improved walking and cycling conditions. |

Note: HOV refers to High Occupant Vehicles (buses, vanpools, and carpools).

Source: Litman, Todd. 2011. *Win-Win Transportation Solutions: Mobility Management Strategies that Provide Economic, Social and Environmental Benefits.* Victoria Transport Policy Institute. Available at http://www.vtpi.org/winwin.pdf. Assessed November 2011.

## 5.3 Solid waste resource accounts

Solid waste resource accounts provide further evidence that the internalization of externalities does not necessarily lead to gloomy scenarios, penalties, and additional user costs, as the transport cost accounts section above might initially seem to imply. On the contrary, a full-cost accounting system that includes social and environmental benefits and costs can point to strengths and advantages that are entirely unacknowledged in conventional accounting systems. The example provided below, taken from the Nova Scotia GPI Solid Waste-Resource Accounts,[82] also illustrates how different and even contrary messages can be communicated by the two different accounting systems, and that it is the conventional accounting system that may misleadingly send overly pessimistic signals to policy makers and the general public.

In 1997, Nova Scotia implemented a leading-edge solid waste-resource strategy that included very high rates of composting and recycling and banning compostable waste from landfills. In less than five years, the province went from almost zero diversion of waste from landfills to 50% diversion — the highest rate of any state or province in North America.

From a conventional accounting perspective this new system looked costly, with operating and amortized capital costs increasing from $48.6 million ($53 per capita) in 1997 to $72.5 million ($77 per capita) in 2001 — an increased cost of $24 million or $25 per capita for implementing changes that included provision of compost bins for all households, and curbside pick-up and sorting of recyclables and organics. After tabulating these costs, the conventional accounts stop there, and they therefore discourage jurisdictions from implementing such sustainable waste management strategies due to their apparently higher costs.[83]

From a full-cost accounting perspective, however, when the new Nova Scotia solid waste-resource system was compared to the old pre-1997 system, it actually produced net savings of at least $31.2 million. This translates into net savings of $33 a year for each Nova Scotian, as opposed to the cost of $25 misleadingly indicated in a narrow conventional accounting comparison of only the operating and amortized capital costs of the two systems. Let's look at why:

In the GPI full-cost accounts, the total benefits of the new 2001 waste management system were found to range from $79 million (low end) to $221 million (high end), or between $84 and $236 per person, with the breadth of the range determined mostly by the assumptions built into different climate change and air pollution damage cost estimates, depending on the scientific models used. It should be noted that the $31.2 million overall net benefit estimate is based on the lowest end climate change and air pollution cost estimates, and may therefore be considered highly conservative.

The benefits considered in the GPI accounts, in part, included:[84]

- $3.3 – $84.3 million in avoided climate change damages due to greenhouse gas emission reductions

- $9.5 – $67.4 million in avoided health and environmental damages due to air pollution reductions
- $18.8 million in extended landfill life due to the high rates of diversion
- $28.6 million in energy savings from recycling compared to costs of production from virgin materials
- $6.5 – $8.9 million in employment benefits through new jobs created
- $1.2 – $1.9 million in avoided liability costs
- $1.1 – $1.7 million in export revenue of goods and services
- $187,000 in additional tourism revenues as delegations from around the world came to Nova Scotia to study the new solid waste-resource system

To break down just one of these categories — energy savings — by way of example, the evidence indicates a saving of 2.4 million Btu for every tonne of glass recycled compared to production of glass from virgin materials; a saving of 8.5 million Btu for every tonne of paper recycled; a saving of 20.1 million Btu for every tonne of plastic recycled; and a saving of 166.9 million Btu for every tonne of aluminium cans recycled.

Compared to these benefits, the total costs of the 2001 solid waste-resource system were $96.6 to $102.7 million:

- $72.4 million in operating and amortized capital costs
- $14.3 million for the beverage container recycling program
- $2.7 million for the used tire management program
- $1.6 million in Resource Recovery Fund Board operating and administrative costs (the non-profit agency created to run and oversee the new system)
- $5 – $9.5 million to increase citizen participation in composting and recycling through education and other programs
- $220,000 – $1.8 million in nuisance costs (including the extra time required by households to sort their garbage)

When the costs and benefits were carefully compared to the pre-strategy costs and any potential double-counting eliminated, the new, sustainable Nova Scotia Solid Waste-Resource Strategy was found to produce a considerable net savings, both in monetary and non-monetary terms. Despite increased operating and amortized capital costs, the new system provided a net savings of between $31.2 million and $167.7 million compared to the operating and amortized capital costs of the old system. In keeping with the caveat to err on the side of conservatism, only the low-end estimate of $31.2 million was cited in the communications and public reporting of results.

To illustrate the relationship between indicators and accounts, the GPI analysis also reached conclusions on the indicator front — namely that Nova Scotia had become a leader both internationally and nationally in solid waste diversion based on a wide range of international comparisons, and that the accessibility, comprehensiveness, and levels of waste being composted and recycled had all vastly improved since the introduction of the new Solid Waste-Resource Strategy. Following are examples of indicator results that were deemed to show "genuine progress" in this area:

- Diversion of waste from landfills increased from less than 5% before implementation of the Strategy to 50% within less than five years;
- Access to curbside recycling in Nova Scotia jumped from less than 5% in 1989 to 99% in 2007;
- 76% of Nova Scotia residents now have access to curbside organics pickup.[85]

Nova Scotia's waste diversion rate decreased briefly after 2000/2001, but then began rising again — at first dropping to 34% in 2005/2006, and then increasing slightly to 36% in 2006/2007. In 2010, it was estimated to have reached about 68%.[86] According to the Nova Scotia Department of Environment, the temporary decline in waste diversion between 2001 and 2006 was due primarily to an increase in the amount of waste being disposed, which according to GPI analysis was, in turn, due to rising GDP and consumption. The fact that the 2008-09 recession likely triggered a major reduction in waste generation and disposal provides a clue that the GPI causal analysis relating waste generation rates to the business cycle is likely correct.

Again, Bhutan is in the enviable position of adapting such past analyses quickly and effectively both to its new National Accounts and to public policy. Full-cost accounting analyses, such as that outlined above, have demonstrated decisively that sustainable waste management strategies based on high levels of composting and recycling are cost-effective and produce high rates of waste diversion from landfills. Based on this evidence, the Kingdom of Bhutan can therefore avoid costly waste disposal options that have degraded the environment in other jurisdictions, and instead move quickly and decisively towards proven sustainable waste minimization and eventually 'zero-waste' solutions.

Thimphu's Greener Way is already taking a lead through its innovative re-use and recycling activities using waste paper, cardboard, aluminium, glass, metal, rubber, and plastics. In less than two years, Greener Way as saved 3,426 trees, 402 barrels of oil, 786 cubic yards of landfill space, 1.2 million gallons of water, and 824,100 kilowatts of energy through its activities, and it has recycled 262 tonnes of waste paper gathered from Thimphu offices, schools, and other institutions.[87]

Given accelerating rural-urban migration patterns, increased packaged and plastic-wrapped imports, and mounting concomitant waste disposal problems, such waste minimization actions and solutions have taken on new urgency in Bhutan. According to Thimphu City Corporation, Thimphu alone generates 51 tonnes of household waste every day, of which Thimphu's Greener way estimates that 60% could potentially be recycled.[88] The country's new National Accounts can quickly provide highly valuable evidence to policy makers of the economic and business case for such sustainable solutions on a societal scale.

## 5.4 Forest accounts

Our natural world provides and performs a wide range of ecological, social, and economic functions, providing people with both direct goods and services like wood, food, and recreational opportunities, and indirect goods and services that support life and enable

human society and the economy to function. For example, an intact, optimally functioning forest ecosystem provides, at no cost, a wide range of vital services including climate regulation, habitat and watershed protection, flood and natural pest control, prevention of soil erosion, formation of topsoil, nutrient recycling, and long-term storage of carbon. It also provides us with beauty and a place to relax and rest our minds.

Preservation of the capacity of nature to yield such a full range of economic, ecological, social, and cultural benefits is sometimes called "holistic" forest use, because this approach seeks to optimize the full range of forest functions. It also recognizes that long-term timber productivity is itself dependent on the preservation of healthy forest soils, age and species diversity, and other vital non-timber functions. Thus, a holistic accounting system like Bhutan's new National Accounts, defines and values a healthy forest as one that has the capacity to perform its full range of functions optimally, including soil and watershed protection; sequestration of carbon; provision of timber, habitat for other species, medicinal plants, and cultural/ religious services, etc.

This approach and measurement and accounting system contrasts markedly with the current and historical "industrial" approach to forestry, in which the primary focus of forest management is to harvest enough wood fibre to meet all available and desired markets. "Sustainability," in an industrial model, is largely measured in terms of how much forest land is regenerated to commercial species. Wildlife, water resources, biodiversity, and ecosystem services receive only token consideration, if at all. When a forest is degraded, its ability to provide such vital "free" ecosystem, social, and cultural services is compromised. Such services may be lost irreplaceably or diminished in effectiveness, or efforts may be made to replace them through often expensive feats of human engineering.

An accurate accounting system like Bhutan's new National Accounts will recognize and count such losses as depreciation of natural capital, just as a factory owner currently counts a depletion or degradation in plant and equipment as depreciation of produced capital. Conversely, a full-cost accounting system explicitly values the full range of both market and non-market goods and services provided by forests.

As previously noted, in 1997 an international team of scientists headed by Dr. Robert Costanza conservatively estimated the average annual value of many of the world's key ecosystem services to be $33 trillion — almost twice the total annual GDP of all the countries on earth. It should be noted, however, that putting a price tag on the value of forests or any other natural capital stock is highly problematic, in large part because there are many forest and other natural capital and ecosystem service values that simply cannot be quantified. Because it omits many such unquantifiable values, the global estimate by Costanza et al. must be considered highly conservative.

Despite the limitations of monetization, however, use of the technique with the limited data that are available does make the intrinsic values of natural forests more clearly visible, and ensures that these values can be duly and properly considered and taken into account in the policy arena. In other words, monetization can be seen as necessary as long as the true values of standing natural forests are ignored by conventional accounting systems and so long as vital non-market forest values continue to be assigned a value of zero in these conventional accounting mechanisms. However, because it is still difficult to estimate total monetary

values in full-cost accounting valuations of forests, this section demonstrates the process of moving from physical indicators towards eventual economic valuations in an area where data and methodological limitations do not yet allow the latter.

A fundamental principle of full-cost accounting methods is the recognition that non-market economic valuations are secondary or derivative processes, which require a firm foundation in physical evidence. If basic physical data for a full-fledged economic valuation of Bhutan's forest services are not currently available, the forest component in the new National Accounts can focus on assembling the available baseline physical data that can provide a basis for a more complete economic valuation at a later stage.

As examples of the kind of physical data needed, the forest ecosystem functions shown in Table 6 below have been identified by de Groot (1992, 1994) as the basis for such forest valuations.[89] However as discussed below, some of the indicators, such as the age structure of the forest, point to multiple functions that may be performed by a single variable such as healthy age diversity, so fewer indicators than are shown in Table 6 will actually be needed for a beginning evaluation.

**Table 6. Forest ecosystem functions for forest valuation**

| Regulation Functions | Indicators |
|---|---|
| Regulation of the local and global climate | - carbon sequestration, temperature, |
| Regulation of runoff and flood-prevention | - hydrological cycle |
| Water catchment and groundwater recharge | - biomass rainfall interception |
| Prevention of soil erosion and sediment control | - tree height structure and density, root systems, leaf area, soil porosity and organic matter, interception |
| Formation of topsoil and maintenance of soil-fertility | |
| Fixation of solar energy and biomass production | - soil interception, tree structure, sedimentation |
| Storage and recycling of organic matter | |
| Storage and recycling of nutrients | - organic cycling, litter decomposition |
| Regulation of biological control mechanisms | - photosynthesis, plant biomass |
| Maintenance of migration and nursery habitats | - ecologically balanced ecosystem populations |
| Maintenance of biological and genetic diversity | - habitat, streams, wetlands |
| | - habitat, wildlife, plants, fungi, microorganisms |
| **Carrier Functions** | **Indicators** |
| Wildlife habitat | - structural diversity, age diversity, food sources, nests and dens |
| Recreation and tourism | - attractiveness, uniqueness, natural diversity, 'naturalness' (nature study, sports, relaxation) |
| Nature protection | - reserves, parks |
| **Production Functions** | **Indicators** |
| Oxygen | - photosynthesis, respiration, decomposition |
| Water (drinking, irrigation, industry etc.) | - water quality, runoff |
| Food resources | - berries, mushrooms, nuts |
| Genetic resources | - ecosystem and species diversity, population viability |
| Medicinal resources | - medicinal plants and fungi, biochemical properties |
| Raw materials for building, construction, industry | - timber, pulpwood |
| Fuel and energy | - fuel wood |
| **Information Functions** | **Indicators** |
| Aesthetic information | - aesthetic quality, landscape, vegetation cover |
| Spiritual and religious information | - spiritual enrichment, continuity, religion |
| Cultural and artistic inspiration | - heritage values, archaeological sites, old-growth |
| Scientific and educational information | - understanding and knowledge of functions of natural systems, nature study, environmental education, applied scientific research, new medicine discoveries, natural process monitoring |

Sources: de Groot, R. S. 1992. *Functions of Nature: Evaluation of nature in environmental planning, management and decision making*. Netherlands, Wolters-Noordhoff; de Groot, R.S. 1994. "Environmental functions and the economic value of natural ecosystems." In Jansson, A. Hammer, M. Folke, C. and Costanza R. (eds.) *Investing in Natural Capital: The ecological economics approach to sustainability*. Washington, D.C., Island Press.

Once researchers have identified the key functions performed by a healthy forest ecosystem, as defined by the scientific literature, they can assess the health of Bhutan's forest ecosystem according to its capacity to perform these multiple functions optimally. Any loss in that capacity — through depletion, conversion (for development purposes, for example), or illegal or unsustainable harvest practices — is described as a depreciation of natural capital and a diminution of its asset value.

Following this identification of key forest functions, the next step is the selection of appropriate indicators — with particular emphasis on those key indicators that may signify capacity to perform multiple functions. In the case of forests, it has been found that *age structure* and *species composition* constitute such key indicators of forest health, since they point to the capacity of forests to protect soil quality and watersheds, store carbon, provide habitat, enhance forest resilience, provide a wide range of other vital ecosystem services, and also produce clear, wide-diameter timber that fetches higher market prices, if some of the timber is to be marketed.

To this end, historical forest inventories may be examined in order to assess the extent to which the age and species diversity of Bhutan's forests are being maintained, improved, or diminished over time. A new state-of-the-art forest inventory currently being planned will allow the most accurate assessment to date of these key dimensions of forest health and quality. Again, it must be emphasized that these indicators (age structure and species composition) are highlighted here because each provides multiple benefits relating to several key forest functions.

Thus, the science indicates that older forests with diverse age, height, and species diversity are more effective than younger forests at storing carbon, providing resilience to insect and disease infestation, providing habitat for a wide-range of forest-dependent flora and fauna species, preventing soil erosion, and producing more valuable lumber.[90] There is also mounting evidence that, by enhancing soil quality, age and species diversity improve timber productivity.

Similarly, species diversity is also an indicator of multiple vital forest functions and enhanced forest resilience. For example, during major spruce budworm infestations in Atlantic Canada, mixed hardwood-softwood forests had far lower rates of spruce defoliation than single-species softwood plantations, largely because the hardwoods provided habitat for bird species that are natural predators of the budworm—indicating that we interfere with nature's intricate balance to our peril.

In addition to these two key indicators — age structure and species diversity — other indicators developed in 1994/1995 as part of the "Montreal Process" might be useful to consider when choosing forest indicators. The Montreal Process — i.e. the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests — was formed in Geneva in June 1994 to advance the development of internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests at the national level. Participants in the Working Group included Australia, Canada, Chile, China, Japan, the Republic of Korea, Mexico, New Zealand, the Russian Federation, and the United States, which together represent 90 percent of the world's temperate and boreal forests. Several international

organizations, non-governmental organizations, and other countries also participated in meetings of the Working Group.

In February 1995 in Santiago, Chile, the above countries endorsed a comprehensive set of criteria and 67 indicators for forest conservation and sustainable management, for use by their respective governments. A Technical Advisory Committee also prepared technical notes to suggest techniques on measurements, data collection, and interpretation for the national-level criteria and indicators.

The Montreal Process explicitly addresses the following forest ecosystem services:

- biological diversity and genetic resources;
- carbon storage and sequestration for mitigation of global climate change;
- soil erosion control and sediment retention;
- water supply and regulation;
- nutrient cycling, biological control, and other ecosystem services;
- provision of timber and employment;
- recreation and the protection of natural and cultural heritage, and other social, economic and cultural benefits.

Again, the Kingdom of Bhutan has the distinct and rare advantage not only of still possessing very large swaths of superb, pristine old-growth forests that optimally perform the wide range of forest functions indicated above, but also of taking advantage of existing comprehensive measurement systems like the Montreal Process to track changes in its own forest ecosystems. The protection of 51% of its land area, the country's present 75% forest cover, and the constitutional provision that at least 60% of Bhutan's land cover will remain forested in perpetuity constitute remarkable commitments to forest preservation and sustainability virtually unmatched in the world. This extraordinary bounty of natural wealth constitutes all the more reason that it be valued fully and properly in Bhutan's National Accounts.

Some of the important physical indicators for forest functions that can be highlighted by Bhutan's new National Accounts and used as the basis for subsequent forest valuations include those listed in Table 7 below.

**Conservation of biological diversity**

Ecosystem diversity

- Forest age class distribution
- Representation of forest types in protected areas
- Protected areas as a percentage of total national landmass
- Level of fragmentation of forest ecosystem components

Species diversity

- Number of known forest-dependent wildlife species
- Number of known forest-dependent species at risk
- Population levels and changes over time for selected tree species

**Impact of disturbance and stress on forest ecosystem health and productivity**

Incidence of disturbance and stress

- Annual removal of wood products compared to the volume determined sustainable
- Harvest methods
- Area and severity of insect attack, disease infestation, and fire damage
- Rates of pollution deposition

Ecosystem resilience

- Percentage of area successfully naturally regenerated and artificially regenerated
- Area and percent of forest land with diminished biological components indicative of changes in fundamental ecological processes

**Conservation of soil and water resources**

Soil quality

- Control of soil erosion and linkages with landslides
- Area and percentage of harvested area having significant soil erosion
- Area and percentage of harvested area with significantly diminished soil organic matter and/or changes in other chemical properties
- Area and percentage of harvested area with significant compaction, displacement, puddling, or changes in soil physical properties resulting from human activities

Water quality

- Water quality as measured by water chemistry, turbidity
- Trends in timing of events in stream flows from forest catchments
- Percent of stream kilometers in forested catchments in which stream flow and timing have significantly deviated from the historic range of variation
- Changes in the distribution and abundance of aquatic fauna
- Percentage of water bodies in forest areas with significant variance of biological diversity from the historic range of variability in pH, dissolved oxygen, levels of chemicals (electrical conductivity), sedimentation, or

**Table 7. Important physical indicators for forest functions**

Source: GPI Forest Accounts. 2001. Volume 1: http://www.gpiatlantic.org/pdf/forest/forest1.pdf and Volume 2: http://www.gpiatlantic.org/pdf/forest/forest2.pdf.

Only after tracking trends in such physical indicators of forest function — with units of measurement in the physical terms appropriate to each indicator — will it be possible to proceed properly to the economic valuation step. As noted, the economic valuations in accounts are always secondary — derived from and ultimately pointing towards the more primary physical indicators of function.

The initial intent of the new National Accounts economic valuations is both to value Bhutan's remarkable natural assets fully as part of its national wealth and to draw the attention of policy makers to the fact that we presently (and misleadingly) count the depletion and degradation of our natural wealth as economic gain in the conventional economic accounts. Doing so will also provide strong support to ongoing conservation policies designed to protect that wealth and prevent its depreciation. As noted, this initial economic valuation will be largely in descriptive terms since full monetization is not yet possible.

In the end, of course, it would be more desirable if the physical indicators themselves were used for policy purposes, since they are far more direct measures than the secondary economic valuations, which are essentially layered over the physical indicators. But in a world still dominated by economic and material priorities, we are not yet at the stage where non-market physical indicators alone will effectively influence long-term policy. The language of economic valuation must therefore still be used for communication purposes, and hopefully in the future, the forest measurement work in the new National Accounts will therefore move towards a more complete economic valuation of Bhutan's forests than is presently possible.

An indicator of the age structure of Bhutan's forests can allow at least a partial economic valuation as a next step. Thus, one forest function that can now be monetized is carbon storage capacity — carbon storage is a 'stock' value — since prices have now been placed on carbon emissions in accord with climate change models forecasting long-term damages, and with carbon trading prices. The carbon storage indicators and corresponding scientific evidence can tell us how many tonnes of carbon Bhutan's forests presently store, and they can track that storage capacity over time in response to changes in protected areas, logging rates, forest fires, and other indicators.

Applying climate change damage costs from the literature to evidence on the physical carbon storage capacity of Bhutan's forests, economic valuations can then tell us, at just over $20/tonne (based on conservative climate change models), how much the present tonne carbon storage capacity of Bhutan's forests will avoid in estimated climate change damage costs. Such valuations will be critically necessary in international carbon trading schemes in order for Bhutan to claim its full share of carbon credits, and to receive proper compensation for the climate protection value of its forest conservation policies.

Unlike Bhutan, most parts of the world have seen significant losses in old-growth forests. In many cases, such age and species diverse forests have been replaced by young single-age, single-species plantations cultivated only for their timber but unable to perform other forest functions effectively. Scientific studies however, indicate that the conversion from old-growth to young forests produces a significant net loss of carbon to the atmosphere, even when the carbon uptake of new forests is taken into account. Therefore, changes in the

abundance of old growth and mature forests will produce concomitant changes in carbon storage capacity, the value of which in turn can be estimated in terms of avoided climate change damage costs.

In accounting language, losses of carbon storage capacity represent a substantial depreciation of a valuable natural capital asset, while an increase in protected areas can be seen as investment in natural capital that will enhance carbon storage capacity. It is important to note that the depreciation of a capital asset can occur as a result of both depletion — as in the loss of equipment or machinery in a factory, or over-harvesting a forest — or degradation — as in a machine in disrepair, or loss of age and species diversity in a forest.

While not all aspects of depreciation can be measured in monetary terms, these losses indicate that value can also be described and assessed in non-monetary terms. Thus, while Bhutan's new National Accounts would not present a full economic valuation of Bhutan's forests in monetary terms, they could move beyond indicators to an accounting and valuation approach that draws specific conclusions, based on strong scientific evidence, on changes in natural capital stock values.

A number of positive opportunities and policy options arise from an honest appraisal and analysis of these types of results. In other words, as soon as the spotlight is shone on any hidden information, viable policy options and solutions naturally present themselves. Effective management of Bhutan's expanding community forests is a case in point. To this end, the new National Accounts could go beyond initial valuations to highlight working case studies of the most sustainable and viable forestry practices available — as models for successful community forest management in the country. Such an analysis could demonstrate that selection harvesting and uneven-aged forest management could increase a wide range of community forest values, and that restoration forestry practices could constitute a sound investment in natural capital value.

In sum, the point of all the "number-crunching" is to provide relevant and useful evidence for informed decision making. In the case of Bhutan's forests, the key policy use of the forest accounts component of Bhutan's new National Accounts will be to conserve, protect, and maintain an extraordinarily precious existing natural asset that provides a wide range of highly valuable ecosystem services and social functions to the nation and far beyond its borders.

**Value of ecosystem services**

As previously noted, using replacement, contingent, and other valuation methods, Costanza et al. (1997) estimated that the value of the world's ecosystem services in 1994 were worth at least US$33 trillion (1994$) per year. This amount represented almost twice the global gross national product (GNP) of approximately US$18 trillion (1994$) per year.

Costanza's team acknowledged, at the time, that there were many "conceptual and empirical problems inherent in producing such an estimate."[91] However, the authors stated that the exercise was "essential" in order to:

- Make the range of potential values of the services of ecosystems more apparent;
- Establish at least a first approximation of the relative magnitude of global ecosystem services;
- Set up a framework for their further analysis;
- Point out the areas most in need of additional research;
- Stimulate additional research and debate.[92]

Costanza and his team also pointed out that the estimates presented were "minimum values" and would likely increase with "additional effort in studying and valuing a broader range of ecosystem services; with the incorporation of more realistic representations of ecosystem dynamics and interdependence; and as ecosystem services become more stressed and 'scarce' in the future."[93]

As part of this massive ecosystem contribution to human society, temperate and boreal forest ecosystems were estimated to contribute a global flow of services worth at least US$894 billion per year (1994$).[94] This is equal to 2.7% of the total value of global ecosystem services estimated by Costanza and his associates, or 5% of the total value of the world's human economy. This estimate is based on the following forest functions: climate regulation, soil formation, waste treatment, biological control, food production, raw materials, recreation, and cultural goods and services.

The estimates by Costanza and his associates are highly conservative, as they exclude 9 out of a total of 17 identified key ecosystem services attributable to forests, due to lack of data and information sources. Thus, values were not provided for gas regulation, disturbance regulation, water supply, water regulation, soil erosion control, nutrient cycling, pollination, habitat, and genetic resources. Some critics have argued that the estimates of Costanza et al. (1997) are actually a vast underestimate, understating ecological service values by several orders of magnitude. [95]

Counting only the eight ecosystem services considered by Costanza and his associates (1997), temperate and boreal forests were found to contribute at least US$302/hectare/year (1994$) in ecosystem services.[96] When converted to Bhutanese ngultrum and updated to 2011 ngultrum using the Consumer Price Index (CPI), this is equivalent to roughly Nu 20,630/hectare/year (Nu 2011). Although these calculations were not explicitly designed to be extrapolated for environmental valuation purposes at the regional level, the benefits valued in these assessments are nevertheless indicative of the values and the vital information missing from conventional resource accounting systems.

Until there is adequate information on the wide range of non-market forest values at the national level, and until there are consistent data measured and monitored on a regular basis to value Bhutan's forest goods and services fully, the assessments and methods used by Costanza et. al. (1997) can provide at least a temporary valuation substitute. In the first ever valuation of Bhutan's ecosystem services, undertaken by Kubiszewski, Costanza et al. using the basic value transfer methodology described earlier, and released in February 2012 alongside this prospectus, the country's forests were found to contribute 93.8% of the total economic value of Bhutan's ecosystem services.

Even if data limitations did not permit such an aggregation of the value of forest services to arrive at a reliable composite estimate of the full value of Bhutan's forests, the economic benefits of various forest functions could still be described, as in the carbon storage example provided above. As well, an estimate adapted from Costanza et al. (1997) can be used as a partial aggregation of the value of the seven forest ecosystem services valued in that study that are certainly applicable to Bhutan forests — i.e. climate regulation, soil formation, waste treatment, biological control, food production, recreation, and cultural services.

In the 2011 Bhutan study undertaken by Kubiszewski, Costanza et al. the monetary value of Bhutan's forest ecosystem services was estimated using the benefits transfer method by multiplying the per hectare economic benefits estimated in a range of other reliable studies by the total area of different kinds and types of forestland in the country using land use mapping tools. For the reasons noted above, and because the values have not been modified to account for Bhutan's specific conditions, the estimates should not be taken as literal values for Bhutan's forests, but are presented alongside this overview report simply to demonstrate how vast, extensive, and valuable the country's forest goods and services are.

As noted above, the 1997 Costanza estimate excludes 9 of the 17 ecosystem services that were not valued by Costanza et al. (1997) due to lack of data. Also, raw materials (timber) are not included in the estimate, since these are separately accounted for in GDP-based estimates. If all 17 ecosystem services described by Costanza et al. (1997) were included in the estimate, the economic value of forest ecosystem services would far exceed the global $33 trillion estimate cited above.

As a second phase in the development of Bhutan's new natural capital accounts, aimed at increasing accuracy and precision, a proper national valuation will need to examine each of the assumptions in Costanza et al. and other studies carefully, and to make the appropriate adjustments for regional conditions based on expert advice and local knowledge. A careful analysis and breakdown of Bhutan's forest structure, type, and conditions will be possible in the nation's next forest inventory that will use sophisticated methods to assess forest quality in detail, and will thereby enable more accurate and region-specific economic valuations.

There are many other methodological issues raised by such valuations. While the present basic value transfer estimates for Bhutan's forest ecosystem services being released alongside this report are averages, and thus take into account different productive capacities of different forest segments, a more careful future analysis, based on new forest inventory data, will be able to consider the different marginal values of different forest areas. For example, one particular hectare may have a very high recreational value, while another may have a minimal recreational value.

Further, a careful national analysis may also consider the *comparative* ecosystem values of Bhutan's forests over time. In other words, if the present basic value transfer estimates undertaken by Kubiszewski, Costanza et al. represent the current value of forest ecosystem functions in the nation, historical descriptions might be referenced to assess what these services might have been worth 40 years ago or 100 years ago when Bhutan's forests may have had a different age and species structure.

To answer such questions, historical records would have to be closely analysed to assess the quality, structure, and composition of the forests to which each estimate applies. Clearly a degraded forest provides fewer and different ecosystem services than a healthy forest, and a single age single species plantation does not provide the same ecosystem services as a diverse old growth forest. In Bhutan, some forests may have appreciated in value due to creation of new protected areas, while others may have depreciated in value due to illegal logging, forest fires, or conversion to farmland. Assessing such changes over time is a potential task for future development of Bhutan's natural capital accounts.

Going beyond GDP and conventional market measures to value natural capital, along with the benefits of non-market goods and services hitherto regarded as 'free', is now widely accepted as the essential way of the future by mainstream institutions, including the United Nations, World Bank, and OECD. Bhutan's new National Accounts will likely be the first in the world to apply such natural capital and ecosystem service valuations systematically and comprehensively — not as mere "satellite" accounts, but are integral components of the core National Accounts. The first ever valuation of Bhutan's ecosystem services, undertaken in 2011 by Kubiszewski, Costanza et al., is a very important contribution to such valuation efforts, which now require further refinement, and its results will be used to spur new developmental work in this vital area.

## 5.5 Cost of work stress: Paid work hours and unemployment

### Paid work hours

The more hours we work for pay, and the less free time we have, the more the economy — as currently measured — will grow, and the "better off" we are supposed to be. Free time and family time count for nothing in our conventional economic accounts. Stress, from either overwork or underwork, is also "good for the economy" in conventional accounting mechanisms to the degree that the purchase of drugs used to manage stress further contributes to GDP growth. As well, the economy can grow even as the quality of work — which supposedly "drives" the economy — deteriorates, as job insecurity grows, as temporary and 'contingent' work replaces 'permanent' work, and as capital-intensive 'jobless' growth sheds jobs. However, conventional accounting and labour force data conceal such trends.

To overcome some of the conventional labour force data shortcomings, Bhutan's new National Accounts will go well beyond the employment rates conventionally used to assess progress. Additional measures can be included that assess the quality, nature, and type of work, and that account for satisfactory work-life balance as a key ingredient in happiness. Paid work can also be examined in its relation to unpaid work, free time, economic and financial security, time stress, and a wide range of societal benefits and costs. In her seminal studies on the Great Depression, for example, Marie Jahoda found that paid work performs a wide range of functions beyond income generation — including giving time structure to a day, enhancing self-esteem and sense of purpose, and providing social contacts and interaction.[97]

From this wider perspective, a broad range of key employment measures can be found in abundant existing research and literature. To give just one example, a highly useful measure estimates the degree of 'hours polarization,' which assesses whether more people are working longer hours, while at the same time large numbers are unable to get the hours they need to make ends meet. In Thimphu, two prevalent examples of long work hours are among shopkeepers and taxi drivers (who drive taxis as a second job to support their families and expenses.

Hours polarization has been demonstrated to contribute to income and social inequities, and thus to negatively affect wellbeing. This trend is invisible in conventional employment statistics that report only aggregates, averages, and overall employment and unemployment rates. In fact, in the economic growth-based statistics conventionally used to measure progress and assess prosperity, long work hours are counted as a contribution to wellbeing because they usually translate into increased output, income, and consumption.

As evidenced in the research literature, however, there are serious economic, social, and environmental costs associated both with increased output and with long work hours. Longer work hours may exacerbate stress, produce adverse health outcomes, reduce time with family and friends, and diminish happiness, while increased output may place excessive demands on our natural resources and on the earth's waste absorption capacity. At the same time, unemployment and underemployment — the opposite end of the spectrum — waste precious human resources and also produce substantial social, human, health, and economic costs. In sum, hours polarization may produce serious costs that remain invisible in the conventional economic accounts.

In Bhutan's new National Accounts, employment-related measures will be selected according to their importance for wellbeing and their capacity to assess progress according to as wide a range of social, economic, health, and environmental variables as possible. While there will no doubt be a number of existing data gaps in efforts to assess quality and hours of work, the employment component of Bhutan's new National Accounts nevertheless will probably be one key area where existing National Bureau of Statistics data from the Labour Force Survey, Bhutan Living Standards Survey, and other sources are relatively plentiful.

Based on existing physical data and trends in work hours and employment, economic valuations of the costs of unemployment, the value of leisure time, costs of leisure time loss, and related issues may be undertaken. For many work hours issues, related economic valuations will not be possible, simply because there will not be enough quantitative information available for this purpose. For example, we know from extensive research that the financial cost of decreased productivity and other losses in the workplace due to work-related stress and overwork-induced fatigue is enormous.

Sleep deprivation and difficulty staying awake while on the job due to overwork not only have serious implications for the health of workers, but also produce substantial costs in productivity losses and exhaustion-related accidents. According to one U.S. estimate, industrial deaths and accidents related to shift work cost the U.S. economy more than US$77 billion a year. This figure includes deaths, plant explosions, plane crashes, fatigue-related car/truck accidents, and lost productivity – the last of which alone accounts for more than 70% of the costs. [98, 99]

As well, some of the world's worst disasters – including the Exxon Valdex oil spill, the Chernobyl nuclear catastrophe (estimated cost $300 billion), the Three-Mile Island nuclear accident, and the deadly Union Carbide chemical leak in Bhopal, India – have been attributed to work fatigue (all occurring during the night shift), as have more than 50% of trucking accidents. Studies point to an estimated 25% decline in sleep time, a 15% increase in clinical insomnia, and a 2-8 fold increase in ulcers and related gastrointestinal problems – all related at least in part to overwork and work stress. Shift workers have a 60% higher rate of divorce than workers putting in regular hours.[100]

Despite such evidence, it is difficult to aggregate such to data to estimates of annual average national losses due to work-related stress and overwork-induced fatigue. As well, even though specific cost estimates associated with losses due to work stress and fatigue are cited in the literature, these direct and indirect cost estimates are often associated with work stress in general and are generally not specific to stress resulting from long or short work hours. As well, there is no agreement on an objective cut-off point in work hours and work demands after which stress-related costs are triggered, and there are no viable methods to quantify the more subjective elements of work stress.

Because of the complexity of such issues, the interaction of a number of factors, and the difficulty of confirming direct one-way causal relationships, it is very challenging to estimate accurately 1) the specific health costs resulting from stress that are directly attributable to long work hours and 2) the lost productivity associated with stress-related absenteeism that may also result specifically from working too many hours.

In other words, the costs cited in the literature often do not represent the costs of long hours of work specifically, but of work stress in general. However, as noted earlier, excessively long hours have been demonstrated to be one significant contributing factor to work stress, fatigue, lost productivity, and accidents, but are by no means the only one. For example, long work hours have been shown particularly to exacerbate stress when combined with lack of control, repetitive routine, lack of support, and other negative work conditions, even though the proportion of stress-related costs specifically attributable to these long work hours has not been reliably determined.

Therefore, it is presently only possible to report cost estimates for work stress in general. To begin the valuation process, such estimates might initially be extrapolated to Bhutan from the research literature in the field. Enough on the subject is known, based on extensive results revealing that work stress is very costly, to begin the valuation process in Bhutan based on the same basic value transfer methodology described above in relation to valuation of Bhutan's ecosystem service values.

As well, the importance of citing such existing evidence indicating that long hours and work overload contribute significantly to this work stress is to illustrate that long work hours do in fact carry hidden costs to the economy, rather than being uncritically assessed as being 'good for the economy', as measures of progress based on conventional GDP-based accounting mechanisms implicitly assume.

Despite the present difficulty of quantifying the costs of excess work hours, there are very important new advances being made in this field that should allow improved economic

valuations in the future. For example, Statistics Canada now administers 10-question time stress surveys as part of its General Social Survey time use surveys, the results of which can be correlated with objective work hours data from both labour force and time use surveys. As well, new costing studies are providing vital new information on the subject that should gradually expand existing knowledge in this important field.

In Bhutan, the CBS GNH Survey has a section on stress that asks whether the respondent's life has been stressful during the last year, and what the main source of stress is. But beyond that, the questions on stress in the CBS GNH survey do not relate specifically to work, so it remains difficult to quantify work stress costs based on Bhutan-specific data.

In a wide-ranging review of the literature, ten years ago the *American Journal of Health Promotion* found stress to be the most costly of all modifiable health risk factors.[101] Further analysis will be required to assess the proportion of such stress costs attributable to work stress and to excessive work hours in particular.

A landmark Statistics Canada study has already found that longer work hours increased the likelihood of negative health behaviours that carry significant risks for cancer, heart disease, hypertension, diabetes, and other chronic illnesses. Thus, compared to women working standard hours, women moving to longer work hours were four times as likely to smoke, twice as likely to consume alcohol, 40% more likely to decrease their physical activity, and more than twice as likely to suffer major depression. Women with high levels of job strain were also 1.8 times more likely to experience an unhealthy weight gain than those with low job strain.[102] Given significant advances in cost-of-illness studies, such evidence on the health impacts of long work hours is an important step towards quantifying at least some of the key economic costs associated with long work hours.

For many of the work-related measures that cannot presently be reliably translated into economic valuations, Bhutan's new National Accounts can at least present a *qualitative* analysis of the costs associated with such employment, stress, and work hours related factors, based on a review of the literature. In this way, data needs and hidden costs can at least be highlighted in descriptive terms to put the issues onto the policy agenda and to pave the way for later data collection that will enable quantitative economic valuations of such costs in the future.

**Unemployment**

Joblessness has been associated with stress, poverty, financial insecurity, poor health outcomes, and a wide range of social problems including family breakdown and crime. For example, an abundance of evidence indicates that the unemployed suffer higher rates of physical and mental illness than those with jobs, and have higher rates of disability, alcohol and drug addictions, and a higher incidence of premature death.

In fact, *both* unemployment and overwork carry health problems and hidden costs, and one Japanese study found that the underemployed and overworked had equally elevated risks of heart attack.[103] Unemployment is also associated with crime. For example, a Canadian Centre for Justice Statistics survey of inmates in Nova Scotia prisons found that 67% were unemployed at the time of admission to the correctional facility.[104]

In addition to health and social costs, there are significant economic costs associated with maintaining large numbers of unemployed people through various social programs intended for those on low incomes. The unemployed also pay less income tax (if any at all) and represent lost productive potential to society.

Official unemployment figures usually include only those who are actively looking for work, and therefore these estimates can actually fall when the unemployed stop looking for work. These so-called "discouraged workers" are not included in official jobless rates. In addition, official unemployment rates exclude the underemployed — those working part-time only because they cannot find suitable full-time employment due to business conditions, but who would rather be working full-time. In addition, there are those who are underemployed who are working beneath their skill level because they have not been able to find appropriate work.

Thus, in order for the unemployment statistics to portray reality more accurately, some jurisdictions have begun collecting supplementary unemployment rates that include discouraged workers and the underemployed. If the additional data are available, costs of unemployment can be calculated using both the official and supplementary rates.

Using costing evidence and methodologies cited in the research literature on unemployment costs, with adjustments for local wage rates, medical and prison costs, and other data, Bhutan's new National Accounts can begin to estimate the output losses and fiscal costs such as lost tax revenues, as well as some social costs including health costs, family breakdown costs, and crime, which could be attributed to unemployment in Bhutan..[105]

Some of the costing categories generally used in unemployment cost analyses include:

- Lost production attributable to the official number of unemployed, by national monetary value, per capita monetary value, and % of GDP.
- Fiscal costs — including any unemployment and social assistance payments, and lost income tax and sales taxes — attributable to the official unemployment rate.
- The potential unemployment attributable economic burden of illness that may be associated with both the official and supplementary unemployment rates. (Epidemiological studies assessing relative risk ratios attributable to unemployment and calculating population attributable fractions, which will both be described in the next section of this chapter, are the basis for these particular illness cost estimates.)
- The economic costs associated with divorce attributable to unemployment, based on existing research literature.
- Amount of money saved in avoided crime costs from reduced unemployment — based on the assumption that a 50% reduction in unemployment will result in a 10% reduction in crime — as indicated in the research literature.

Since many of these cost estimates are based on assumptions that require further testing and verification, particularly in a Bhutanese context, and in the absence of precise data allowing for accurate relative risk ratios and the calculation of population attributable fractions, the unemployment cost estimates should be used only for illustrative purposes.

However, based on the evidence available, it is nevertheless clear that the social, health, and crime costs attributable to unemployment are likely to be very considerable, and that even crude attempts at estimation are likely to be considerably more accurate than the arbitrary assignment of a zero value to these costs, as implied by conventional GDP-based accounts. Delineation of these costs, even in a preliminary way based on extrapolated evidence and data, will allow the longer-term social costs of unemployment to be adequately considered in the policy arena.

## 5.6 Costs of illness

### Costs of illness attributable to risk factors

In the human capital arena, cost of illness studies explore, for example, the overall costs of preventable chronic disease and specific illnesses; the costs of behavioural risk factors such as alcohol abuse, tobacco use, physical inactivity, and unhealthy weights; and the health impacts of factors such as air pollution, toxic wastes, unemployment, poverty, and gambling.

In this section we specifically focus on behavioural risk factors, which have seen the greatest advances in costing methodologies in recent years, and where results are therefore relatively more reliable than for other health conditions where quantification and development of reliable relative risk ratios are more challenging. A very brief overview of some key sample results in three areas — smoking, obesity, and physical inactivity[106] — is followed by a basic outline of methods and steps taken in full-cost accounting cost of illness studies and an outline of data and methodological improvements that will enhance the accuracy of these estimates in the future.

Cost of illness studies generally estimate both direct and indirect costs associated with particular diseases and attributable to particular risk factors. Direct costs include direct health expenditures on hospitals, doctors, drugs, and research associated with chronic diseases that are linked to behavioural risk factors. Some studies also estimate direct mental health costs attributable to particular diseases or risk factors. For example, evidence indicates that those who are physically inactive have higher rates of depression than those who are active. Indirect costs are productivity losses due to premature mortality and disability related to the risk factor under examination.

The costs of behavioural risk factors are very high. Smoking, obesity, and physical inactivity are all preventable causes of sickness and premature death. Together these three risk factors are estimated to account for about 25% of direct taxpayer-funded health care costs.

These three risk factors are first described briefly here to illustrate their proven relation to health outcomes and costs, after which we outline basic well-accepted methodologies used to assess health-related costs attributable to these risk factors, which can be applied without delay in Bhutan's new National Accounts.

### *Tobacco use*

Although the sale of tobacco is banned in Bhutan, it is not illegal to smoke. For that reason, smoking costs are cited here as an example of a costly behavioural risk factor for which cost of illness methodologies are now well developed. As the basis for such an economic valuation, data from the CBS GNH Survey can be used. That survey asks a number of questions about smoking such as if the person smoked during the last 12 months, if the person smokes daily or occasionally, and how many cigarettes a day the person smokes now.

Worldwide, tobacco alone — including both direct smoking and exposure to Environmental Tobacco Smoke (ETS) — presently is responsible for the deaths of about one in ten adults, and by 2030 the World Bank estimates that it will be responsible for the deaths of one in 6, or 10 million people a year — more than any other single cause of death.[107] In Canada, Health Canada reports that 21% of all deaths are attributable to smoking — amounting to 45,000 preventable deaths a year.[108]

Ninety per cent of lung cancers are attributable to smoking, and tobacco is also a significant risk factor for a wide range of other cancers, coronary heart disease, respiratory illnesses, and a range of other ailments.[109] In fact, tobacco is the only product sold legally in most areas of the world (with the exception of Bhutan) that causes sickness and death when used exactly as intended.

These health impacts produce real economic costs, though paradoxically many of those costs — like hospital, physician, and drug costs as well as cigarette sales — contribute to GDP and are therefore misleadingly counted as contributing to prosperity and progress in GDP-based measures of progress. By contrast, Bhutan's new National Accounts will count these as costs not gains to the economy, and will register lower rates of illness and risk behaviours as signs of progress, improved wellbeing, and savings to the economy. Existing data in Bhutan, when combined with epidemiological evidence elsewhere, allow such smoking cost valuations to be undertaken without delay.

### *Obesity*

While obesity is not yet a major problem in Bhutan, increasingly sedentary lifestyles, automobile dependence, and high fat diets will certainly increase the incidence of obesity. The traditional spicy and fat-rich Bhutanese diet, which was not a problem when the calories were needed for intense physical activity, will lead to overweight problems in the future unless the diet changes or unless physical activity becomes more prevalent, especially in urban areas. The obesity cost example is therefore cited here both because of its growing relevance to Bhutan, and also because it illustrates the importance of ongoing improvements in both costing methods and data sources.

In terms of direct burden on the health care system, obesity is the second most preventable and costly cause of illness and premature death in North America after smoking,. It has been linked to a wide range of chronic diseases including type 2 diabetes, heart disease, hypertension, and gallbladder disease. Rates of overweight and obesity have more than doubled globally in the last two decades. In some jurisdictions, it has been estimated that

annual direct health care costs of obesity account for roughly 5% of total health care budgets.

Recently, the accuracy of obesity cost estimates has improved substantially through use of new data sources and costing methodologies. This is discussed in greater detail below to illustrate significant recent improvements in full-cost accounting methods and mechanisms from which Bhutan can now benefit, and which should always be ongoing.

### *Physical inactivity*

Physical activity has proven benefits in preventing disease, improving health, and promoting independence and happiness in old age.[110] The most substantial body of evidence for achieving healthy active aging relates to the beneficial effects of regular exercise.[111] Physical activity has been called "the most obvious of variables which might reduce overall lifetime morbidity" and the "cornerstone" of any strategy aimed at prolonging disability-free life expectancy."[112]

Studies have found that physically active adults have lower rates of lifetime illness than those who are inactive. The evidence indicates that regular physical activity protects against obesity and assists weight control; fosters development of healthy muscles, bones and joints; increases strength and endurance; enhances mental health; improves behavioural development in children and adolescents; and helps maintain function and preserve independence in older adults.

Because regular exercisers have much less overall lifetime morbidity than those who are sedentary, medical costs avoided due to physical activity are not simply deferred to older ages. Abundant evidence shows that physical activity helps protect against heart disease, stroke, hypertension, type 2 diabetes, colon cancer, breast cancer, osteoporosis, obesity, depression, anxiety, and stress. Conversely, abundant epidemiological evidence shows that physical *inactivity* is linked to a wide range of chronic illnesses, including diabetes 2, heart disease, hypertension, and colon cancer. Epidemiological evidence also links physical inactivity to poor mental health, including higher rates of depression, anxiety, and stress.

**Basic methodology for estimating the economic costs of any risk factor**

Following the methodologies used in studies published in the *Canadian Medical Association Journal* and other peer-reviewed medical journals*,* the following steps are necessary to estimate the economic costs of any risk factor. These steps are useful for estimating basic costs, but other more sophisticated methods that need more precise data have also been developed and can be used to gradually improve the accuracy of valuation methods over time.

1. First, the epidemiological evidence is examined to ascertain the relationship between any proven risk factor (here using physical inactivity as an example) and various diseases. This is expressed as the "relative risk" (RR) of developing a particular disease for a physically inactive person compared to an active person. For example, if sedentary people are twice as likely to develop heart disease as active people, then the relative risk (RR) is 2.

For economic valuation purposes, it is not necessary to directly examine the primary epidemiological evidence to calculate relative risk ratios, but rather peer-reviewed secondary sources can be used for this purpose. Thus, previously published meta-analyses and large prospective epidemiological studies can be used to estimate the relative risks of suffering from various chronic diseases attributable to physical inactivity or other risk factors.

2. The second step is to ascertain the prevalence of a risk factor within a given population using existing surveys, expressed in this example as the percentage of the population that is physically inactive. Such surveys often classify respondents as either "active", "moderately active" or "inactive" using accepted cut-off lines based on kilocalories of energy expended per kilogram of body weight. Those data in turn are derived from accepted survey questions on quantity and frequency of different types of physical activity.

3. Third, to assess the public health burden of sedentary living, or of any other risk factor, the relative risk ratio (step 1) is combined with the prevalence of physical inactivity (or other risk factor) in the population (step 2). The resulting population attributable fraction (PAF) of a disease is an estimate of the effects of an individual risk factor on the prevalence of a given disease at the population level — i.e. the extent to which each disease is attributable to the risk factor. The population attributable fraction (PAF) of a disease is, therefore, the proportion of each chronic disease that could theoretically be prevented by eliminating physical inactivity.

   Many such costing studies estimate the population attributable fraction (PAF) for each disease using the following formula:

   $$[P(RR - 1)] / [1 + P(RR - 1)]$$

   where P is the prevalence of physical inactivity in the population and RR is the relative risk for the disease in an inactive person. As noted below, however, recent evidence has challenged the customary use of that formula.

4. The fourth step is to multiply this population attributable fraction (PAF) for each disease by the total cost of treating that particular disease. For this step, it is necessary to have national health cost statistics, and especially the illness costs by diagnostic category. In other words, the direct health care costs of treating the particular diseases that are linked to physical inactivity are estimated by using the population attributable fraction (PAF) of each disease to estimate the fraction of those costs that is attributable to physical inactivity. To develop such a national health care cost database in Bhutan, hospital, medical, and drug records will need to be scrutinized to attribute costs by diagnostic category.

5. Indirect productivity losses due to inactivity-related (or other risk factor-related) premature mortality and disability or morbidity for each of the diseases can be estimated by estimating the ratio of indirect to direct costs, and then applying this ratio to the

direct cost estimates. Although it is not always possible to know the indirect costs, these can often be extrapolated from the literature as a proportion of total costs and then applied to Bhutan. Again, it is much more accurate to attempt an estimate for this category, using the best available evidence from other jurisdictions, than to assign it an arbitrary value of zero.

Such extrapolated evidence on direct to indirect cost ratios, derived from other jurisdictions, is likely to be fairly reliable for Bhutan, since heart disease, cancers, diabetes 2, hypertension, and other chronic diseases follow fairly predictable patterns across cultures. In other words, the *profiles* of different chronic illnesses will not differ dramatically across cultures, while the different *ratios* of direct to indirect costs for heart disease and diabetes 2, for example, do not depend on absolute numbers like wage levels or hospital costs, which do differ dramatically in different nations. It is those ratios derived from other studies that are used here to assess indirect costs, once direct costs have been determined based on the best local evidence.

6. The number of premature deaths attributable to physical inactivity (or any other risk factor) can be estimated by multiplying the number of deaths attributable to each inactivity-related disease by the population attributable fraction (PAF) for that disease. For example, deaths from inactivity-related diseases in Bhutan would include deaths from heart disease, stroke, colon and breast cancer, diabetes, hypertension, and osteoporosis.

   However, this method has been revised by the U.S. Centers for Disease Control and Prevention (CDC), which demonstrated different results when PAFs specific to mortality are used than when PAFs for disease are used to estimate premature deaths. CDC has therefore advised that PAFs comparing the number of deaths, by cause of death, among the physically inactive or obese population with the number of deaths from the same cause in the physically active or healthy weight population should be used to determine premature deaths attributable to the risk factor.

7. Finally, the cost savings that could potentially be realized from a 10% reduction in physical inactivity can be derived by recalculating the population attributable fractions (PAF) of each disease and corresponding costs by assuming, for example, a 56% prevalence of inactivity instead of a 62% prevalence —the 56% (rounded) prevalence is 62% minus 6.2% (representing an approximate 10% reduction in physical inactivity). The savings can then be estimated according to the difference between the two sets of costs.

The above steps describe the basic method used to estimate costs of physical inactivity as an example, but the methodology is similar to that used in cost of obesity, tobacco, and other risk factor studies. The outline above does not go into details, like the challenges in matching the diagnostic categories in the epidemiological literature with those in health statistics databases. These and other methodological issues are described in actual reports available in the literature, particularly in peer-reviewed journals that are increasingly available online.

We now summarize some of the recent advances in methodology in this field that reflect the dynamic nature of this ongoing work, and which show the potential for ongoing improvements in accuracy over time. Resource and time limitations did not allow an investigation of the degree to which existing data sources in Bhutan will allow application of these more advanced methodological techniques.

However it bears repeating here that imprecise valuation efforts of natural, social, and cultural capital by no means invalidate the resulting estimates, or constitute a reason not to undertake such studies without delay. Use of extrapolated evidence and even quite primitive methodologies to produce derived results will produce far more accurate results than assigning an arbitrary value of zero to natural, social, and human capital assets, let alone perversely valuing sickness costs and cigarette sales as economic gain, as conventional GDP-based accounts presently do.

The following section on methodological advances is therefore presented not to discourage valuation efforts using simpler methods based on existing data sources, but rather to demonstrate the important and rapid advances in the field of social, human, and natural capital valuation that will allow continual upgrading and improvement of Bhutan's new National Accounts over time.

**Update on cost of illness methodologies, definitions, and data sources**

A number of new developments have occurred in recent years to improve and standardise definitions, costing methods, and data sources. These advances — illustrated here for obesity cost analysis — indicate the dynamic nature of the field and the intensive work now under way to account more accurately and comprehensively for benefits and costs that remain invisible in conventional GDP-based accounts. Improvements in illness cost and risk factor evidence have been matched in the policy arena by a new emphasis on health promotion and disease prevention to complement the traditional focus on health care and illness treatment.

In the area of obesity cost analysis, for example, recent developments include new definitions for obesity and physical inactivity, expanded risk factor/ disease associations, new directly measured obesity data in some jurisdictions — especially for overweight and obesity in children and youth, and new burden of illness costing data.

As well, significant policy shifts include new emphases on illness prevention strategies, and on health promotion and protection, which have produced for example healthy nutrition guidelines for schools and comprehensive tobacco control strategies. The latter have already helped sharply reduce smoking rates in areas that have introduced such strategies — most dramatically among teenagers — and the success of these health promotion programs in turn will significantly impact future costing projections. In other words, just as present chronic illness costs reflect past rates of smoking, obesity, and physical inactivity, so any present improvements in health promotion efforts will reduce future costs.

It should be noted that a major impetus to health promotion efforts has been the escalating health care costs faced by governments around the world, with such costs generally occupying an ever-increasing share of government budgets. Parallel to this effort to control rising health care costs has been a growing awareness of the high preventable portion of

such costs, and the recognition that a healthier population will make fewer demands on health care systems. Cost of illness and risk factor studies have contributed directly to this growing understanding, and thus to the proliferation of health promotion policies. This vital policy function has in turn spurred the methodological improvements outlined below.

It must be acknowledge that some of the methodological advances in this field of human capital valuation are quite complex, while some of the best new data sources that rectify past biases, and which might be used to extrapolate results to Bhutan, do not yet have sufficiently large sample sizes to cross-tabulate results by age, gender, and other factors. As well, such updates do not always explicitly account for the impacts, trends, and cost implications of new policy developments in the health promotion field. In sum, there is always further to go in this important developing area of study.

A few specific examples of these new developments are provided here for illustrative purposes, particularly to indicate the dynamic and evolving nature of data sources and methods.

### *New epidemiological literature*

The knowledge base in the areas of obesity and physical inactivity has expanded exponentially in recent years. Indeed, the vast majority of obesity and physical inactivity research in general — and costing work in particular — has all happened in the last 15 years. Unlike tobacco research, which has a much longer history, these two risk factors were not studied nearly as extensively over such a long period (several decades), and the scientific understanding of their importance as health risk factors and of their actual costs is much more recent.

Since 2000, obesity awareness has increased both among researchers and among policy makers and the general public, as obesity has become a major and escalating problem particularly in the West. As a result, there has been a substantial increase in new obesity-related literature — particularly in the field of epidemiology — investigating the association between obesity and various illnesses, and accounting for potential confounding factors.

A search for obesity-related evidence in only one database, Medline, showed that during the 1970s, 10,197 obesity-related articles were indexed in Medline, and during the 1980s, 11,800 were indexed. During the 1990s, the number rose to 17,754, and between 2000 and 2008 alone, 42,913 articles were published, reflecting a remarkable increase of more than 260% from two decades earlier. Other databases and literature searches reveal similar increases, all pointing to a massive, and very recent, expansion of the knowledge base in this important area.

Proper costing updates for obesity and physical inactivity will require careful study of the new epidemiological literature, which provides new information on the relation between these two risk factors and particular health and illness outcomes. That in turn, will require adjustments in the relative risk factors associated with particular diseases based on the most reliable evidence now available in meta-analyses of the epidemiological literature. It will also require the addition of new illness categories now reliably associated with obesity and physical inactivity on which insufficient epidemiological evidence was available a decade ago.

To give just one example, original 2000 cost of obesity studies included evidence and costs for three types of cancer — colon cancer, endometrial cancer, and post-menopausal breast cancer. More recent 2009 cost of obesity work now includes 14 different cancers reliably related to obesity.

In addition, new cost studies will need to take into account new definitions, new data sources, and new methodologies, plus the new understanding that now exists of some of the problematic issues involved in using earlier, less refined costing methodologies. In short, cost of illness studies constitute a relatively new field, in which most significant advances have been made in recent years. This well illustrates the dynamic and fast-changing nature of full-cost accounting work and its emergence as a major field of study. A few specific examples follow.

### *New definitions*

The definition of a non-market variable affects its scope, what is measured and excluded, and thus the resultant trends and cost estimates. For example, new definitions of physical inactivity and obesity now produce very different prevalence rates that are not comparable to those used in original costing studies in these areas. The definition of "physically active" in early cost of physical inactivity studies undertaken 15 years ago was quite different from the definition now more universally accepted.

Specifically, in the definition now universally accepted, people are considered physically inactive or "sedentary" if they report a usual daily leisure-time energy expenditure amounting to less than 1.5 kilocalories per kilogram of body weight per day (kcal/kg/day). Individuals are defined as moderately active if they expend 1.5-2.9 kcal/kg/day, and as "active" if they expend 3.0 or more kcal/kg/day. Calculations are made based on individuals' reporting of the frequency and duration of different types of physical activity using independently established values for the energy demands of each activity. "Regular" physical activity (at the levels indicated) is generally defined as at least 15 minutes of leisure time physical activity 12 or more times per month for people aged 12 and over (though some surveys are based on the population 15 and older).

By contrast, the earlier definitions of physical activity and inactivity used in cost of physical inactivity studies used more demanding standards, and thus produced higher rates of physical inactivity and lower rates of physical activity. As well, physical activity monitoring surveys, on which earlier studies were based, were generally administered to persons aged 18 and older, thus again producing different results than in surveys administered to persons aged 12 and older. Specifically, the subjects of some earlier surveys were rated according to whether their physical activity levels were sufficient for "optimal health benefits." Physical inactivity, according to this measure, was defined as less than 12.6 kilojoules (kJ)/kg of body weight per day of physical activity — the minimum judged necessary to obtain health benefits from physical activity.

Other definitions of physical activity and inactivity have also been used. For example, some publications called for an hour of low-intensity activity every day for adults aged 25–55, or 30–60 minutes of moderate-intensity activity, or 20–30 minutes of vigorous-intensity activity 4–7 days a week. Yet other survey evidence assessed physical activity levels according to

whether respondents reported exercising three or more times weekly, once or twice weekly, less than once weekly, or never. Estimates of physical activity rates were then produced based on these very different criteria.

Such significant differences between the different definitions of physical activity and inactivity will clearly produce markedly different prevalence rates, which in turn will subsequently affect cost estimates for 'physical inactivity,' depending on how it is defined. These definitional differences will produce significant differences in cost estimates of physical inactivity in two important ways. First, they will affect use of epidemiological evidence to assess relative risk ratios associating physical inactivity with particular diseases, since relative risk estimates will differ according to amounts of physical activity expended by study subjects. Second, the definitional differences will affect estimates of physical inactivity prevalence rates. Reliable and consistent relative risk ratios and prevalence rates for physical inactivity, in turn, are both necessary bases for any comparable cost estimates either over time or across jurisdictions.

In short, new cost of physical inactivity studies now generally use the new definition and data on prevalence rates that have become universally accepted, rather than the wide range of earlier definitions and prevalence data. This renders the current generation of studies far more reliable and comparable than was previously the case.

Similar definitional changes have occurred with regard to the obesity cost estimates. Overweight and obesity measures are generally based on an internationally accepted indicator of relative weight called "Body Mass Index" (BMI) that is calculated by dividing weight in kilograms by height in metres squared. But early cost of obesity studies (15 years ago) often used different definitions of obesity based on BMI than that subsequently adopted by international bodies. The new guidelines, which describe a body weight classification system that can be used to identify health risks associated with different rates of BMI in individuals and populations, are in accord with the World Health Organization (WHO) recommendations that were released in 2000 and that have now been widely adopted internationally.

For example, between 1988 and 2003, for adults aged 20 to 64, a body mass index (BMI) of 20–24.9 was classified in some studies as being "acceptable weight," a BMI of 25–26.9 as "some excess weight," and 27 or higher as "overweight."[113] Epidemiological evidence on relative risks for particular disease categories was therefore often assessed for those with a BMI of 27+, and the terms "obesity" and "overweight" were sometimes used interchangeably for those with a BMI of 27+.

In 2003, based on the new WHO guidelines and on new research on the relationship between BMI and risks of morbidity and mortality, guidelines for body weight classifications for (non-pregnant) adults were updated. In the process, the age classification for overweight and obesity estimates was standardised at '18 years and over' instead of the earlier 20–64 age group categorisation that had often previously been used in overweight and obesity prevalence estimates.

There has been an ongoing debate about whether the new guidelines should be used for all ethnic groups. Studies have found different cut-off points for Asian populations than for

Caucasian populations, with Asians having heightened risk for disease at lower BMIs than Caucasians. For example, an Asian person with a BMI of 27.5 might be at risk for comparable diseases at rates associated with obesity in a Caucasian person with a BMI of 30. However, in 2004, a WHO expert consultation group recommended that the existing international BMI definitions should be retained for global use, but it also recommended methods that Asian countries could use to make decisions about how to define increased risk for their populations.[114]

The new guidelines also identify "underweight" as having a BMI of under 18.5, "normal weight" as having a BMI of 18.5–24.9, "overweight" as having a BMI of 25.0–29.9, and "obese" as having a BMI of 30 or greater. The new guidelines further divide "obese" into three levels: BMI 30.0–34.9 (obese-Class I); 35.0–39.9 (obese-Class II); 40 or greater (morbidly obese-Class III). Relative risk ratios have been found to differ substantially between these different categories, thus also allowing for much finer and more accurate cost estimates than were previously possible, and for breakdowns of aggregate obesity cost estimates according to the proportion of total obesity costs attributable to different categories of obesity.

In addition — as part of the new guidelines — a level of abdominal fat measurement, which is rarely used in surveys or studies, was changed from a waist to hip ratio to a waist circumference measure. Altogether, the new classifications substantially affect both the relative risk ratios and the prevalence rates used in most studies, both of which are essential bases for any cost estimates.

### *New and more precise data*

Prevalence rates and cost estimates for non-market variables can also become considerably more accurate with improvements in data sources. For example, some jurisdictions are now using new directly-measured height and weight data — the basis for calculating BMI — rather than self-reported height and weight data from surveys. Evidence has shown that directly measured BMI data are considerably more accurate than self-reported data, which tend to be biased.[115] This bias is not always gender-specific, but it has been found that men generally tend to overestimate their height, while women more often tend to underestimate their weight — perhaps, as S. Connor Gorber et al. note, because of social desirability and the stigma that can be associated with obesity.[116] As well, it was found that overweight and obese individuals tend to misrepresent their height and weight more often than do those with normal weight.

In general, therefore, self-reported data on height and weight tend to underestimate BMI, which in turn results in fewer people being classified as obese than is actually the case, and in correspondingly lower and overly conservative obesity cost estimates. In addition, the association found between obesity and morbidity tends to differ depending on the data collection method.[117]

For example, in a recent study, Margot Shields et al. of Statistics Canada found that the prevalence of obesity in Canada in 2005 was 22.6% when based on measured data, and only 15.2% when based on self-reported data from the same individuals — a very substantial difference of 7.4 percentage points that indicates nearly 50% more Canadians being classified

as obese according to directly measured data than according to self-reported data.[118] This substantial difference is much more important in costing studies that depend upon accurate estimates on the relative risks of disease associated with particular BMI levels and on obesity prevalence at a particular point in time, than in assessing relative trends over time that are more concerned to assess whether rates are increasing or declining. Such trend estimates may reasonably assume that the BMI under-reporting bias has remained relatively consistent over time and will therefore not substantially affect trend reporting. Even that assumption, however, must be qualified by further evidence on the magnitude of disparity by age group, which indicates that BMI underestimates may become progressively greater as the population ages, since older people are more likely to overestimate their height based on the height they once had. In that regard, an aging population will produce ever more downwardly biased results.

Despite the far greater accuracy of directly measured data, it must be acknowledged that the advantages of using directly measured data are balanced by the reality that sample sizes for directly measured data are usually very much smaller than for self-reported data, which seriously compromises the statistical validity of the directly measured results when broken down by region and by diagnostic, socio-demographic, and obesity class categories. However, methods are now being developed and tested to enable adjustment of self-reported data to approximate directly measured results.

In response to the need for more accurate data, some jurisdictions have now developed new forms of data collection with larger sample sizes, which directly measure physical health, including BMI, blood pressure, heart rate, lung functioning, and cardiovascular fitness, among other factors. This type of enhanced data collection will provide important new health data, which in turn will potentially enable far more accurate assessments of illness and risk factor costs than has hitherto been possible.

As noted, small overall sample sizes may have statistical validity when results are used in aggregate, for a whole nation for example, but will seriously compromise the statistical validity of results when broken down by region, disease, obesity class, and socio-demographic factors. If, due to the expense of collecting directly measured data, sample sizes cannot be enlarged to produce statistically valid results, the self-reported results can still be used through the development of adjustment methods and formulae allowing conversion of the much less accurate self-reported to the more accurate directly measured results. In sum, ongoing improvements in data sources are gradually allowing increasingly accurate and more precise cost estimates of non-market variables.

### *More advanced and precise methodologies*

As a result largely of work by the Centers for Disease Control and Prevention in the U.S., and by Beverly Rockhill Levine and colleagues — who found that previous epidemiological and costing studies frequently had computation errors — new methodological understanding on how to conduct cost of illness studies has been developed in the last few years.[119, 120]

Specifically, Rockhill et al. found that one of the most common errors has been the use in the epidemiological and costing literature of adjusted relative risk ratios in association with the wrong formula to estimate population attributable fractions for the proportions of

particular chronic diseases attributable to obesity, physical inactivity, tobacco, and other risks. That commonly used formula, referenced in Step 3 of the basic costing methodology above, is as follows: The population attributable fraction (PAF) for each disease is calculated as [P(RR – 1)] / [1 + P(RR – 1)], where P is the prevalence of the risk factor (obesity, smoking, physical inactivity, etc) in the population, and RR is the relative risk for the disease in an obese, smoking, or inactive person compared to a non-obese, non-smoking or physically active person.

Rockhill and her associates argued that either a formula other than the one commonly used should be utilized in association with *adjusted* relative risk ratios, or that the relative risk ratios used with the common formula should *not* be adjusted for confounding factors, since this adjustment removes part of the population from the estimate. Rockhill et al. note: "The magnitude of bias resulting from this error will depend on the degree of confounding."[121] On the other hand, it is important to adjust the relative risk ratios to account for factors such as age and gender that could be associated with both the risk factor and the disease, and therefore could confound the results.

Since the vast majority of epidemiological studies report *adjusted* and summarized (rather than unadjusted) relative risk (RR) ratios, it will be very challenging to obtain unadjusted RR results for use in the common PAF formula without consulting the study authors and going back to original unadjusted data sets that are rarely provided in the peer-reviewed epidemiological and medical journals in which the study results were published. Despite these challenges, this new methodological understanding requires that future costing studies for any risk factor, including obesity, tobacco, and physical inactivity, should, to the extent possible, use unadjusted RR ratios.

The major advances and improvements in definitions, data sources, and methods referenced above have all occurred in the space of less than 15 years. And the advances will continue. For example, as noted, small directly measured survey data are often based on sample sizes that are presently insufficient to produce reliable age, gender, and obesity class prevalence and cost breakdowns by region and other characteristics, and insufficient even to produce reliable national data when results are broken down by diagnostic, obesity class, and socio-demographic categories. In the short term, the use of adjustment methods to convert self-reported data to at least an approximation of directly measured data is recommended. In the longer term, larger sample sizes in directly measured data will hopefully eventually allow reliable obesity prevalence rates and cost estimates for these key confounding variables. Such additional information, in turn, will allow more careful and accurate targeting of policy interventions designed to promote healthy weights.

This discussion simply serves to illustrate the dynamic nature of the full-cost accounting field, which gradually allows substantial improvements in precision and accuracy over time in valuing non-market variables. Already results and cost estimates are possible today that were not feasible 15 or 20 years ago, and so there is no longer any reason to delay adoption and implementation of a full-cost accounting system. Actual adoption and use of such a system will in turn be the greatest possible spur to further improvements in data sources and methodologies, and in finer and more precise definitions and category breakdowns that will allow ever more accurate reporting and targeting of policy interventions.

As previously noted, the depths and complexities of full-cost accounting mechanisms require dedicated training in order to expand technical capacity in the field. But this chapter at least serves to illustrate — by way of a broad summary overview — some examples of the kinds of methods used in full-cost accounting analysis that can be implemented without undue delay using existing data, on the understanding that methods, data sources, and accuracy can gradually be improved over time. Also as noted, the Institute for Sustainable Solutions at Portland State University stands ready both to assist in providing the training needed to expand capacity in the field, and — in the interim — to provide any required assistance to apply the methods in practice in Bhutan's new National Accounts.

What is beyond debate is the absolute necessity of beginning to value our social, human, and natural capital, and the non-market services they provide, and of moving without delay beyond the narrow, outdated, and even dangerous conventional accounts that ignore these vital components of our wealth and thereby send highly misleading signals to both policy makers and the general public. The good news is that — with Bhutan's having the political will to develop, use, and apply the new National Accounts — for the first time a nation has made a commitment to take that vital step towards creating the foundation of a new wellbeing and sustainability-based economic paradigm. The work-in-progress quality of Bhutan's new National Accounts is no reason not to begin that implementation work immediately, since even preliminary economic valuations constitute far more comprehensive and accurate assessments than the current practice of ignoring vital social, human, and environmental benefits and costs, which effectively counts these as zero.

In sum, there is no question that use of the full-cost accounting mechanisms in Bhutan's new National Accounts will effectively inform policy, lead to far more accurate assessments of the nation's assets and liabilities, and produce real evidence-based decision-making That improved evidence base in turn will inevitably substantially improve the quality of policy and direction required to create a true GNH-based society in Bhutan for the benefit of future generations.

## 6. New policy directions

*To see the world through a GNH lens is akin to viewing light through a prism: the prism doesn't create the colours, but merely separates the colours that are already there.*

In sum, there is no longer any question that the current GDP-based accounting system is incapable of measuring progress in society, and that using it for this purpose has proven not only dangerous, but delusional. The serious shortcomings and limitations of GDP-based measures have now been widely acknowledged in conventional circles, as evidenced by major recent 'Beyond GDP' conferences hosted by the OECD and European Union.

When we actually start using appropriate tools — both indicators to assess progress and accounts to assess value — to measure what we value as a society, the resulting trends and economic valuations naturally point and lead to policies aimed at creating genuine progress and furthering gross national happiness.

Valuing a healthy and educated populace (human capital), decent living standards reflecting sustainable levels and types of produced capital, strong, safe, and vibrant communities (social capital), a dynamic and living culture and wisdom traditions (cultural capital), and a clean and healthy environment (natural capital) will finally give Bhutan a true measure of its actual wealth.

And when we start using full-cost accounting methods to count the hidden costs of economic activity as well as the benefits, we will create sane economic policy and lay the foundation for the new wellbeing and sustainability-based economic system that the whole world so desperately needs.

The adoption of the new expanded capital National Accounts in Bhutan — undertaking to value natural, human, social, and cultural capital in addition to produced and financial capital — is an enormously far-reaching commitment that will eventually produce a new form of budget estimates, a new set of economic accounts, and the foundation and bedrock of a genuine, holistic GNH economy.

This prospectus is designed to show that all the conditions and tools are present for the creation of the new National Accounts and the expanded capital valuations, which in turn will provide evidence and direction to policy makers and play a major role in integrating GNH vision, goals, values, principles, and practices into the fabric of Bhutanese society and daily life.

Of course, the all-party consensus that now exists in the country on these GNH goals and priorities, which will be formalized in the structure of the new National Accounts, does not

eliminate the need for debate. While consensus goals, shared vision, and non-partisan measurement can help unify a society and provide a strong basis for evidence-based decision making and informed dialogue, politics is about *how to* get there and how to realize the shared vision. Thus, the appropriate role of democratic politics is to debate the best way to achieve the desired goals, even while there is a consensus on what those goals are, on the agreed ways of measuring progress towards those goals, and on *what* needs to be valued.

For example, there can be complete consensus on the need to reduce poverty, sickness, pollution, and greenhouse gas emissions, and in some cases even agreement on specific targets, and at the same time vigorous debate on how best to achieve those goals and targets.

In other words, there should be a consensus on goals — the realm of measurement — and debate on strategy — the realm of politics. Bhutan's new National Accounts can play a major role in reinforcing the former and thus create an excellent ground for the latter, thereby ensuring that vibrant democratic debate reinforces rather than undermines fundamental unity and national consensus on goals and values.

While the expanded capital model is increasingly recognized as essential to value a society's full wealth, to track any depreciation in its assets, and to signal the need for re-investment, much work needs to be done to dislodge the existing GDP-based accounting system from its overwhelmingly predominant status. That system, after all, has held sway for well over half a century — influencing policy makers, economists, financial analysts, and journalists worldwide, and literally determining what makes it and does not make it onto the policy agendas of governments.

Again, this argument should not be misinterpreted to mean that the GDP should be abolished or even modified. When used for its intended purpose — to measure the size of the market economy and its expansion and contraction — it is a useful tool in its present form. However, it is the misuse of GDP to assess progress, prosperity, and societal wellbeing — a practice that has given it a far more dominant policy role and position than a mere measure of market size warrants — that must be vigorously challenged ***as*** Bhutan's new National Accounts are adopted.

For example, it must be made explicit that GDP-based growth measures are almost always invoked in isolation from the social purposes that the economy is intended to serve, and from the health of the environment that supplies the resources required by the market economy to function and that absorbs the wastes generated by the economy, and that for these reasons the current misuse of those measures has become increasingly misleading and dangerous.

When no longer in a predominant position, GDP statistics will need to be released much less frequently than at present, which will free up the resources required for more comprehensive measures of progress and for expanded capital full-cost accounts.

This work of measuring progress more comprehensively and accurately, and of fully adopting and implementing the expanded capital accounts — and thereby of displacing the predominant role of GDP-based measures — needs to happen very quickly if we are to salvage the key components of our true wealth before it is too late.

Fortunately, the Kingdom of Bhutan, through the CBS GNH survey and creation of the nine-domain GNH Index, has already taken major innovative steps in measuring its progress comprehensively, with each new survey expanding the time series required to assess program accurately.

But because GDP is not an indicator but an accounting system, the next essential step is now to bring that holistic measurement directly into the country's core National Accounts. Without that, the GDP-based growth paradigm will continue to drive the economy and public policy, and may even sideline the new GNH measures. In taking this vital step, the Kingdom of Bhutan will perform an invaluable service to the world.

Indeed, if the world continues to assign an arbitrary value of zero to its natural, human, social, and cultural wealth as at present; if it continues to ignore their depreciation; if it continues to treat the essential services that natural, human, social, and cultural capital provide as so-called 'externalities'; and if the true costs of economic activities remain hidden, then it will indeed be too late for human civilization as we currently know it to save itself.

It is scientifically demonstrable and undeniably true that our children will be growing up in a world where forests, oceans, soils, lakes, rivers, and energy sources have been seriously depleted and degraded by human activity. Already, they are sharing a poorer natural world with fewer living species than our parents did, and they are faced with an increasingly uncertain and perilous future due to climate change.

Piecemeal measures and tiny advances — while partial signs of progress from a relative perspective — are simply not keeping pace with the rate of natural capital depreciation. Bhutan's new National Accounts will provide the comprehensive accounting and measurement framework required to facilitate a much more concerted and committed policy effort towards maintaining and restoring wealth for the sake of our children and for all the species that share this planet. By laying the foundation for the new wellbeing and sustainability-based economic paradigm that the world needs, Bhutan can lead the way for other nations to follow.

Because of the country's deep-seated commitment to a holistic GNH-based development philosophy, policy makers at all levels of government in Bhutan are extraordinarily well placed to begin the paradigm shift away from what one commentator called "brain-dead accounting," towards valuing and counting what matters to the Bhutanese populace and to society at large. They have at their disposal the tools and ability to put in place the indicator and accounting framework required to assess progress and prosperity accurately, and to inform policies that provide key conditions and opportunities for genuine happiness. With the availability of the new National Accounts and the wealth of policy-relevant information they contain, the present generation of policy makers will have powerful tools to take the actions needed not only to enhance wellbeing and prosperity in Bhutan but to provide much needed leadership in the world.

Because the new National Accounts are a system of 'net' rather than 'gross' accounting, and because they demonstrate the linkages between social, economic, and environmental variables, full-cost valuations inevitably send more accurate signals about the nature of reality to policy makers than is possible in a system narrowly based in market economy growth

statistics. They therefore have predictive power and send early warning signals than can prompt timely remedial action that in turn can stimulate effective course corrections to ward off crises before they occur.

To cite just a few North American examples:

- Natural capital valuations of North Atlantic fish stocks could have prevented the 1992 collapse of ground fish stocks, which have never recovered.
- North American full-cost accounting studies in the last 12 years predicted the contraction of the voluntary sector, which was invisible in GDP, market-based statistics that ignore unpaid work, and could have stimulated support for the voluntary sector before its services contracted. .
- Full-cost accounts predicted the long-term decline in the economic viability of family farming that was also invisible in the conventional accounts that tracked only gross farm cash receipts and hid major declines in *net* farm income.
- Perhaps most poignantly given the economic collapse of 2008-09 from which the world has not recovered, full-cost accounts pointed to the fragility of household finances in light of rates of debt growth that vastly exceeded rates of income growth, thus imperilling the capacity of households to service their debt loads. By contrast, conventional accounts sent no early warning signals of the impending economic collapse.

The key issue here is quite simply that if the Royal Government of Bhutan uses the new full-cost National Accounts to make policy choices, such warning signals will be clearly visible and facilitate timely corrective action that can potentially avoid the kind of adverse outcomes experienced in the past. There is no barrier to Bhutan adopting and implementing the new expanded capital accounting tools as guides to policy, and to use them as the nation's core valuation measures.

As noted on several occasions in this prospectus, the new National Accounts do not have to be fully developed before they can effectively adopted and used. In fact, they will always be a "work in progress" as new and improved data sources and methodologies are developed over time, as additional components are added, and as further spin-off research and analysis are undertaken based on initial core results.

Thus, to get started, the economic valuations of natural, social, and human capital that have been developed in other jurisdictions can often be extrapolated to Bhutanese conditions and circumstances during the initial research and development phase, and while work is still under way to identify the best and most accurate measurement methodologies and the most reliable direct data sources of local data. Implementation of the new accounts with confidence in Bhutan is possible because — after a period of extensive research and development in the global research community — the reliability, accuracy, comprehensiveness, feasibility, utility, and policy relevance of the full-cost accounting measures have been repeatedly demonstrated.

The good news for policy makers is that use of the new accounts will save government money by providing a concrete tool to assess program efficiency and cost effectiveness.

Which programs, for example, are effectively achieving their targets and which are not? Which interventions are most cost-effective and get the best results for modest investments? And how can market mechanisms that properly account for social and environmental benefits and costs reduce the need for costly government intervention and regulation? The new accounts are designed to answer just such questions.

In the interests of 'truth in advertising,' it is important to acknowledge that the proposed adoption and use of the new National Accounts will require courage. That is because political will is required not only to adopt a new accounting system (which in turn means presenting annual budgets to account for the value of natural, human, social, and cultural capital in addition to produced capital) *but also* to allow the new statistics to challenge the materialist messages being sent by the conventional GDP-based measures through the existing economic paradigm. Clearly, this is no business for the faint of heart. It will take commitment, resolve, and vision. For example, because the new accounting system will record differential environmental impacts by income and assess time, income, and wealth distribution, it will also naturally lead policy makers to focus more on redistributive policies and work time options than on untrammelled growth and economic stimulus strategies.

As well, once the new accounting system has been adopted by government, it will provide a basis for a system of financial incentives and penalties designed to encourage sustainable behaviours that contribute to wellbeing, and to discourage unsustainable behaviours that undermine wellbeing. This can include very practical actions such as shifting taxes from low-income households to carbon and pollutant emissions; and subsidising public transit, organic farming, and uneven-aged forest management while increasing taxes and fees on gas-guzzling vehicles, synthetic fertilizers, and plastics.

Quantifying such incentives and penalties can be accomplished on the basis of hard evidence, because the underlying full-cost accounts provide an objective basis for determining the monetary value of such financial incentives and penalties, since the accounts assess — according to the best available data — the true and actual benefits and costs of economic activity to society. Economic incentives to protect and conserve soils, watersheds, forests, wetlands, and the atmosphere will in turn maintain and even enhance the value of these natural capital assets and ensure their long-term sustainability.

These incentives and penalties in turn will naturally affect consumer prices, which will then change behaviour. Indeed, it is widely accepted by economists and other analysts that price signals are by far the most effective tool to influence behaviour at a societal level. For example, in North America, it was skyrocketing fuel prices rather than concern for the environment that prompted ordinary citizens to switch from their SUVs to more fuel-efficient vehicles, just as massive increases cigarette taxes proved more effective in sharply reducing teenage smoking rates than any other measure.

To take one concrete example — again from Nova Scotia — in 2007, the Nova Scotia government invested considerable resources, undoubtedly with good intention, in a 'Buy Local' campaign launched with great fanfare. The following news release of the official launch was placed on the government website: "Selecting Nova Scotia first is the theme of an exciting, new marketing campaign aimed at promoting locally grown and produced food. The government's buy-local campaign, Select Nova Scotia, was announced by … the

Minister of Agriculture today…. The event featured a logo unveiling, website introduction, details of upcoming promotional activities and the announcement of a Minister's Advisory Committee on 'Buy Local'.[122]

Unaccompanied by appropriate price signals based on full-cost accounting mechanisms, however, this program — with all its attendant costs and human and financial resources — was bound to have very limited success, if not to fail entirely in its objectives.

On a societal scale, it has been repeatedly shown that consumers will not switch en masse to locally grown food so long as imported food is cheaper. Indeed, there has been no evidence of any substantial shift in retail chain ordering practices and consumer preferences to locally grown food in the years that the Nova Scotia government's buy local program has been in effect. In fact, the two large retail chains that supply Nova Scotians with such a large proportion of their food have virtually ignored the campaign. The available evidence indicates that only 8.4% of the food Nova Scotians consume is produced on Nova Scotia farms — down from close to 15% in the early 1990s.

And yet, from a full-cost accounting perspective, it is absurd that organically grown local food is more expensive in retail stores than chemically grown food imported from 2,000 km away — a perversity made possible only by ignoring the true costs of soil degradation, transportation, greenhouse gas and pollutant emissions, and other actual costs of production and distribution, and by ignoring the true value of improved nutrition, freshness, health, resource conservation, and the multiplier job and financial effects of stimulating the local farm economy.

In other words, once goods are accurately and properly priced according to the true costs of production and distribution, not only will consumer behaviour change, but the market economy will become considerably more efficient. The full-cost accounting system is designed precisely to provide the objective evidence basis for the system of financial incentives and penalties that in turn will reduce the price of sustainably produced local food and raise the price of chemically produced imported food — precisely because the true and full benefits of the former and the actual costs of the latter will be properly and accurately reflected in food prices. In that context, a buy local campaign is far more likely to succeed than when price signals send a message contrary to the government's program and intention.

Similarly, a full-cost accounting system that assesses the true costs of energy use will naturally produce a system of government penalties and incentives that penalize wasteful energy use and reward energy conservation, which in turn will be reflected in the price structures that determine behaviour.

In short, an economy that reflects the actual benefits and costs of the production and distribution of goods and services is the most effective tool that can move society towards genuine sustainability and societal progress. The new National Accounts can begin to provide the means and instruments to make this happen, and to create an economy based on GNH principles, values, and practices. That, in turn, will provide essential leadership for the larger world and will benefit Bhutan economically as others come to study and learn from the nation's actions. All that is required is the courage and political will to adopt, use, and implement these new accounting tools.

## Endnotes

[1] Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi. 2009. Report by the Commission on the Measurement of Economic Performance and Social Progress. Paris. http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

[2] Costanza, Robert. 2008. "Stewardship for a 'Full' World." *Global Trends*. pp. 30–35.

[3] Thinley, Jigmi Y. "Rio+20 Submission: Bhutan". 2011. United Nations. http://www.uncsd2012.org/rio20/index.php?page=view&type=510&nr=690&menu=20

[4] The Institute for Sustainable Solutions (http://pdx.edu/sustainability/institute-for-sustainable-solutions-at-portland-state-university) is the focal point for inter and trans-disciplinary sustainability research, teaching, service, and outreach at Portland State University. Portland State University is a comprehensive research university located in Portland, Oregon, U.S. It enrols about 27,000 students annually and teaches courses and conducts research in the liberal arts, the natural and social sciences, and the professions.

[5] Professor Robert Costanza is Director of the Institute for Sustainable Solutions, Portland State University; and Distinguished Research Fellow at several major institutions, including National Council for Science and the Environment, Washington, D.C.; Stockholm Resilience Center, Sweden; and New Zealand Centre for Ecological Economics, Massey University, New Zealand. Dr. Costanza is one of the world's foremost pioneers in ecological economics and natural capital accounting, and made global headlines when he led an international team of scientists and economists that, for the first time ever, in a ground-breaking peer-reviewed study, estimated the economic value of the world's ecosystem services to society.

[6] An online ecological economics course developed by Drs. Costanza and Kubiszewski is available for free download and use at *http://www.metacourses.org/ecologicaleconomics/*.

[7] Costanza, Robert, et al. "Valuing Nature: Accounting for the Value of Natural Capital and Ecosystem Services: GNH Accounts Workshop, 29–30 March 2011, Thimphu. Record of meetings and workshop." Hosted by National Statistics Bureau, Royal Government of Bhutan, in collaboration with GPI Atlantic.

[8] Thinley. Op cit..

[9] Costanza. Op cit.

[10] Saul, John Ralston. "Good Governance as the key to Gross National Happiness". Keynote address. The Second International Conference on Gross National Happiness. Rethinking Development: Local pathways to global wellbeing. June 24, 2005. Antigonish, Nova Scotia. http://www.gpiatlantic.org/conference/proceedings/saul.htm.

[11] Spellerberg, A. and the Social Capital Programme Team. 2001. Framework for the Measurement of Social Capital in New Zealand, Statistics New Zealand, Wellington. http://www2.stats.govt.nz/domino/external/web/prod_serv.nsf/874ea91c142289384c2567a80081308e/0de858ad74601d18cc256b3b00751314/$FILE/R14.pdf

[12] Repetto, R. and Austin, D. 1997. *The Costs of Climate Protection: A Guide for the Perplexed*. World Resources Institute, Washington, D.C.

[13] When the GDP in the U.S. was analyzed it was found that in both 2001 and 2002 growth in the GDP was entirely due to Mortgage Equity Withdrawals (MEW)–where consumers borrow money against the real value of their homes. According to a report by John Mauldin based on data collected by Alan Greenspan, well known U.S. economist and former Chairman of the Federal Reserve (1987–2006), "without U.S. homeowners using their homes as an ATM, the economy would have been very sluggish indeed, averaging much less than 1% for the six years of the Bush presidency…. Without MEWs, the period from 2001–2007 would have seen GDP growth of less than 1%." Mauldin, John. October 17, 2008. "Thoughts from the Front Line: The Economic Blue Screen of Death." http://www.2000wave.com/index.asp.

[14] Costanza, Robert, John H Cumberland, Herman Daly, Robert Goodland, and Richard Norgaard. 1997. *An Introduction to Ecological Economics*. Boca Raton, Fla., CRC Press.
[15] Daly, Herman. 1994. "Operationalizing Sustainable Development by Investing in Natural Capital," in Jansson, A., Hammer, M., Folke C., and Costanza, R. (editors), *Investing in Natural Capital: The Ecological Economics Approach to Sustainability,* International Society for Ecological Economics, Island Press, p 7.
[16] Gross National Product (GNP) refers to the market value of all goods and services produced by a country's "nationals" or citizens, wherever that production takes place. Thus, the Bhutan GNP includes the production of Bhutanese overseas, but not the production of Indian companies in Bhutan, for example. Gross Domestic Product (GDP) refers to all production within a country's borders, whether by its own nationals or by foreigners. While his Majesty the King of Bhutan compares Gross National Happiness to Gross National Product, which was formerly the internationally accepted basis for measuring economic growth, GDP is today the norm in measuring economic growth and is therefore generally used in this report as well.
[17] GPI Atlantic, Pannozzo, Linda, and O'Brien Minga, 2003. *Forest Accounts for Nova Scotia.* Available at www.gpiatlantic.org.
[18] Brown, Lester R., 2011. "Governments Spend $1.4 Billion Per Day to Destabilize Climate." http://www.earth-policy.org/data_highlights/2011/highlights24#
[19] Costanza, Robert. 2008. Cited in Alister Doyle. "Crunch may put price tag on environment." *Reuters*. October 21.
[20] Brown, Lester. 2006. Lecture given for World Affairs Council of Northern California. Video available at http://video.google.ca/videoplay?docid=-4449532225517541673&ei=Bf8sSo2gFoei-AGo2IiwCQ&q=%22World+Affairs+Council+of+Northern+California%22+Lester+Brown&hl=en.
[21] National Statistics Bureau. Royal Government of Bhutan. 2010. *National Accounts Statistics, 2009*. http://www.nsb.gov.bt/pub/nar/nar2010.pdf.
[22] Ibid.
[23] Pigou, Arthur. 1932. *The Economics of Welfare,* Fourth edition. London. MacMillan and Co.
[24] Statistics Canada. "About the environment and resource accounts". http://www.statcan.gc.ca/nea-cen/about-apropos/env-eng.htm.
[25] Cameron, Silver Donald, 2009."Voting for Clarity and Sanity," *Sunday Herald,* 17 May.
[26] GPI Atlantic, *The GPI Transportation Accounts for Nova Scotia.* Available at www.gpiatlantic.org
[27] The Institute for Sustainable Solutions (http://pdx.edu/sustainability/institute-for-sustainable-solutions-at-portland-state-university) is the focal point for inter and transdisciplinary sustainability research, teaching, service, and outreach at Portland State University. Portland State University is a comprehensive research university located in Portland, Oregon, U.S.A. It enrols about 27,000 students annually and teaches courses and conducts research in the liberal arts, the natural and social sciences and the professions.
[28] An online ecological economics course developed by Dr. Robert Costanza and Dr. Ida Kubiszewski is available for free download and use at http://www.metacourses.org/ecologicaleconomics/.
[29] Parlange, M. 1999. "Eco-nomics." *New Scientist*. 161: 42-45.
[30] Costanza, R., Farber, S.C., and Maxwell, J. 1989. "Valuation and Management of Wetland Ecosystems." *Ecological Economics*. 1: 335-359.
[31] In 1997, an international group of scientists used replacement values and contingent valuation methods to estimate the value of the world's ecosystem services at US$33 trillion per year. Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., and van den Belt, M. 1997. "The value of the world's ecosystem services and natural capital". *Nature*. 387: 253-259.
[32] The ESV Study Database can be accessed through Earth Economics at http://eartheconomics.org.

[33] Costanza, Robert, et al. 2006. "The Value of New Jersey's Ecosystem Services and Natural Capital." Gund Institute for Ecological Economics, University of Vermont. http://www.state.nj.us/dep/dsr/naturalcap/nat-cap-2.pdf.
[34] Commission on Social Determinants of Health. 2008. *Closing the gap in a generation: Health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health.* Geneva, World Health Organization. http://www.who.int/social_determinants/thecommission/finalreport/en/index.html. http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf
[35] NS Department of Health Promotion and Protection. 2003. Nova Scotia Chronic Disease Prevention Strategy. Dalhousie University, Unit for Population Health and Chronic Disease Prevention on Behalf of Working Group Members. p. 19. http://www.gov.ns.ca/hpp/publications/CDP_Strategy_Report_Final_October30.pdf.
[36] Ibid.
[37] Commission on Social Determinants of Health. 2008. World Health Organization. Op. cit.
[38] Statistics Canada, *Canadian Social Trends,* Autumn, 1991, catalogue no. 11-008-XPE, p. 14. Judith Frederick, *As Time Goes By . . . Time Use of Canadians,* Statistics Canada, catalogue no. 89-544E, p. 25; Statistics Canada, *Women in the Workplace,* catalogue no. 71-534, p. 55; Colman, Ronald. 1998. *The Economic Value of Unpaid Housework and Childcare in Nova Scotia.* GPI Atlantic. Halifax; Andrew Harvey and Arun K. Mukhopadhyay, May 2007. "When Twenty-Four Hours is Not Enough: Time Poverty of Working Parents," *Social Indicators Research,* volume 82, no. 1.
[39] Statistics Canada. 1995. *Households' Unpaid Work: Measurement and Valuation,* System of National Accounts, Catalogue no. 13-603E, no. 3, p. 3.
[40] Aristotle. 1958. *Politics.* Ernest Barker (trans). New York. Oxford University Press.
[41] Goetzel, Ron, ed. May/June 2001. "The Financial Impact of Health Promotion". *American Journal of Health Promotion.* 15, 5.
[42] Shields, Margot. 1999. "Long Working Hours and Health." Statistics Canada. *Health Reports.* 11, 2: 33-48.
[43] Coleman, D. 1993. "Leisure Based Social Support, Leisure Dispositions and Health," *Journal of Leisure Research*, 25: 350–61; Mannell, R.C. 1999. "Older Adults, Leisure, and Wellness," *Journal of Leisurability*, 26, 2.
[44] Jahoda, M. 1982. *Employment and Unemployment: A Social-Psychological Analysis.* Cambridge University Press. London. Cited in Pannozzo and Colman. 2004. pp. 298–299.
[45] Ibid; and other sources cited in Pannozzo and Colman. 2004. p. 299.
[46] Sokejima, S. and S. Kagamimori. 1998. "Working hours as a risk factor for acute myocardial infarction in Japan: Case Control Study". *British Medical Journal.* No 317: 775–780.
[47] Marmot, Michael and Richard Wilkinson. eds. 1998. *Social Determinants of Health: The Solid Facts.* World Health Organization. p. 10.
[48] "Stunning Statistics Reveal Toll of Poverty on Children". *Vancouver Sun,* December, 28, 1990; cited in Province of British Columbia. 1996. *Cost Effectiveness/Value of Nutrition Services: An Annotated Bibliography.* Prevention and Health Promotion Branch. Ministry of Health. B.C. July 1996. p. 5.
[49] *British Medical Journal.* 1998. "Editorial: The Big Idea." April 20.
[50] Pickett, Kate, and Richard Wilkinson, 2007."Child wellbeing and income inequality in rich societies: ecological cross sectional study." *British Medical Journal.* 335. 7629, p 1080. November 24.
[51] See, for example, Osberg, Lars. 1995. "Rethinking the Equity/Efficiency Tradeoff". *Canadian Association of Business Economists (CABE) Journal*; Sharpe, Andrew. 2001. Opening Talk. IRPP-CSLS Conference on the Linkages between Economic Growth and Inequality. Ottawa.
[52] Wilkinson, Richard and Kate Pickett. 2010. *The Spirit Level: Why Equality is Better for Everyone.* London. Penguin Books.
[53] Osberg, Lars and Andrew Sharpe. 2005. "How Should We Measure the Economic Aspects of Well-Being?" *Review of Income and Wealth*, June, 51.2: 311-336. See also: Centre for the Study of Living Standards, "Academic articles on the Index of Economic Well-being".

http://www.csls.ca/iwb/articles.asp. Osberg, Lars and Andrew Sharpe. 2011. "Moving from a GDP-Based to a Well-being Based Metric of Economic Performance and Social Progress: Results from the Index of Economic Well-Being for OECD Countries, 1980-2009". CLSL. http://www.csls.ca/reports/csls2011-12.pdf.

[54] Roberts, Julian. 1994. *Public Knowledge of Crime and Justice: An Inventory of Canadian Findings. A report prepared for the Department of Justice*, p.7. This and numerous other international studies and opinion polls cite the importance of physical security and low crime rates as one of the highest priorities as a quality of life determinant.

[55] Hayward, Karen, Linda Pannozzo and Ronald Colman. 2010. *Educating for Gross National Happiness in Bhutan: Developing Curricula and Indicators for an Educated Populace: A Literature Review*, GPI Atlantic, for the Royal Government of Bhutan.
Vol 1–3 – http://www.gpiatlantic.org/pdf/education/bhutaneduc_litrev_1.pdf;
Vol 4–6 – http://www.gpiatlantic.org/pdf/education/bhutaneduc_litrev_2.pdf.

[56] This "ideal comprehensive indicators" list can be found in the Appendix of the Education Indicators for the Nova Scotia Genuine Progress Index report available from http://www.gpiatlantic.org/pdf/education/nseducation.pdf.

[57] As previously mentioned in the Preface of this propsectus, in March 2011 Dr. Costanza and his team conducted a workshop in Bhutan on valuing ecological services and they are returning in February 2012 to assist Bhutan in constructing the framework for a new wellbeing and sustainability-based economic paradigm in preparation for a major 2nd April United Nations meeting and for the Rio + 20 process. Dr. Costanza and his team have also committed to helping Bhutan develop its new National Accounts.

[58] In 2010 Bhutan Power Corporation (BPC) imported 3.25GWh of power from both Assam and West Bengal, an increase by 26.89%, compared to 2.56GWh imported in 2009 (*Business Bhutan.* 18 June, 2011. http://www.businessbhutan.bt/?p=6344). In 2009, Bhutan imported 20 million litres of motor and aviation spirit worth Nu 724 million. Bhutan's per capita energy consumption has been relatively higher than that of neighbouring countries and the demand for it is increasing by 12 percent annually. *(Bhutan Observer.* 14 June 2011. http://www.bhutanobserver.bt/rising-energy-demand-calls-alternatives/)

[59] http://www.bhutanobserver.bt/%E2%80%98brown-cloud%E2%80%99-penetrates-bhutan/

[60] Gleick, Peter H. 1996. "Basic Water Requirements for Human Activities: Meeting Basic Needs." *Water International.* 21: 83–92. http://www.emro.who.int/ceha/pdf/Basic.pdf.

[61] The 2009 Waste Prevention and Management Act and 2007 National Environment Protection Act of Bhutan prohibit dumping of wastes by river banks or into any water bodies, and prohibit washing clothes or vehicles by any water bodies, including rivers, streams, and ponds. Tanden Pem. "Waste still mounting in Duksum town," *Bhutan Observer*, 8 August 2011. http://www.bhutanobserver.bt/waste-mounting-duksum-town/.

[62] De Villers, Marq, 2001. *Water: The Fate of Our Most Precious Resource.* Mariner Books; See also Lifewater International at http://www.lifewater.org/water-conflict.

[63] World Wildlife Fund, Global Ecological Network, and Zoological Society of London. 2011. "Living Planet Report 2010: Biodiversity, biocapacity, and development." http://www.worldwildlife.org/sites/living-planet-report/WWFBinaryitem18260.pdf.

[64] IPCC (Intergovernmental Panel on Climate Change) 2007. *Climate Change 2007: Synthesis Report.* p. 30. http://www.ipcc.ch/ipccreports/ar4-syr.htm.

[65] Peter Berry and Dawn Paszkowski. Climate Change and Health Office, Health Canada. "Assessing the Capacity of Individual Canadians to Adapt to the Health Impacts of Climate Change." Natural Resources Canada, Speakers Series.
http://adaptation.nrcan.gc.ca/speakerseries/pdf/presentation_berry_for_web_e.pdf.

[66] Walker, Sally, Anne Monette, and Ronald Colman. 2001. *The Nova Scotia Greenhouse Gas Accounts for the Genuine Progress Index.* GPI Atlantic. http://www.gpiatlantic.org/pdf/greenhouse/ghg.pdf.

[67] Stern, Sir Nicholas. 2006. "Executive Summary", *The Stern Review: The Economics of Climate Change.* http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf.

[68] BBS (Bhutan Broadcasting Service). "Tackling green house gas emission", 15 November 2011. http://www.bbs.com.bt/bbs/?p=7242.
[69] See for example, GPI Atlantic, *Transportation Accounts for the Nova Scotia Genuine Progress Index*. Available at www.gpiatlantic.org.
[70] For introductory information, see: The Katoomba Group and UNEP. 2008. Forest Trends, *Payments for Ecosystem Services Getting Started: A Primer*. http://www.unep.org/pdf/PaymentsForEcosystemServices_en.pdf.
[71] To further progress in the development of such natural capital valuations for Bhutan's water resources, Dr. Costanza has offered the assistance of his team in helping to update and improve Bhutan's existing hydrological model as a key step towards the valuation process.
[72] Dr. Costanza has indicated that his team will work with government agencies and other groups in Bhutan to help establish such models.
[73] The factors that contributed to the economic turnaround in the Netherlands are numerous. Shorter work time arrangements contributed to the success in the Netherlands in reducing its unemployment rate but are by no means the only reason for the country's success. According to Anders Hayden, other factors include "low inflation, sound public finances, competitive firms, low inequality, and preservation of social protections." Hayden, Anders. 1999. *Sharing the Work, Sparing the Planet. Work Time, Consumption and Ecology*. Between the Lines. Toronto, p. 149.
[74] CBC News. Underwear company to shrink work week to save jobs. March 19, 2009. http://www.cbc.ca/canada/nova-scotia/story/2009/03/19/ns-stanfields-jobs.html.
[75] Service Canada. 2009. *Worksharing*. http://www.servicecanada.gc.ca/eng/work_sharing/index.shtml.
[76] Hayden, Anders. Op cit.
[77] GPI Atlantic website: http:www.gpiatlantic.org
[78] In 2007, the average income per person per day in Bhutan was Ngultrum (Nu) 40 and the average income in rural areas was even lower at Nu 33 per day. Original source: SNV. http://www.raonline.ch/pages/bt/ecdu/bt_ecostats03.html.
[79] Victoria Transport Policy Institute's (VTPI) website: http://www.vtpi.org.
[80] Tshering Wangdi. "More electric vehicles to hit the market." *Bhutan Times*. 09 Oct, 2011. http://www.bhutantimes.bt/index.php?option=com_content&task=view&id=2910&Itemid=94.
[81] Litman, Todd. 2011. *Win-Win Transportation Solutions: Mobility Management Strategies that Provide Economic, Social and Environmental Benefits*. Victoria Transport Policy Institute. http://www.vtpi.org/winwin.pdf.
[82] Walker, Sally, Ronald Colman, Jeffrey Wilson, Anne Monette, and Gay Harley. 2004. *The Nova Scotia Solid Waste-Resource Accounts*. GPI Atlantic. www.gpiatlantic.org/pdf/solidwaste/solidwaste.pdf.
[83] Dollar figures in this section are in Canadian funds.
[84] Only a partial list of benefits is included here, and therefore these figures do not add up the total benefits cited.
[85] The percentage of residents with access to curbside composting is not the same as the percentage who participate in curbside composting. According to recent Statistics Canada data on this, the percentage of residents who participate in curbside composting increased from 19% in 1994 (when only backyard leaf litter was generally collected) to 69% in 2006 (the full organics pickup program). These figures do not include those residents who compost in their own backyards — for which participation rates and quantities processed are unknown. However, all Nova Scotia municipalities also promote backyard composting, particularly for leaf and yard waste. Indeed, from a GPI full-cost account perspective, backyard composting is preferable to curbside collection of compost, due both to direct savings in avoided curbside collection costs and indirect benefits including decreased transportation and energy costs, reduced transport-related GHG emissions and road maintenance costs, and the substitution of nutrient-rich compost for fossil fuel-based garden fertilizers that are a cause of water pollution. Composting rate data from Statistics Canada. 2007. *Envirostats*. Volume 1, no. 1. Catalogue no. 16002-XIE.

http://www.statcan.ca/english/freepub/16-002-XIE/2007001/article/10174-en.htm.

[86] van der Werf, Paul. 2010. "The Power of the Ban: Nova Scotia's organics diversion system". *Solid Waste Magazine*. April/May. pp 27–28. http://www.2cg.ca/pdffiles/april-may-2010.pdf.

[87] Tandin Pem, "Green leader shows the way". *Bhutan Observer*. 27 January – 3 February, 2012, p 4.

[88] Ibid

[89] de Groot, R. S. 1992. *Functions of Nature: Evaluation of nature in environmental planning, management and decision making*. Netherlands, Wolters-Noordhoff; de Groot, R.S. 1994. "Environmental functions and the economic value of natural ecosystems." In Jansson, A. Hammer, M. Folke, C. and Costanza R. (eds.) 1994. *Investing in Natural Capital: The ecological economics approach to sustainability*. Washington, D.C., Island Press.

[90] Wide diameter, clear lumber, found predominantly in older forests, fetches higher prices in the market place than does small-diameter knotty lumber produced by younger forests.

[91] Costanza, Robert, et al. 1997. "The Value of the World's Ecosystem Services and Natural Capital," *Nature*. 387: 253–260. p. 253.

[92] Ibid.

[93] Ibid.

[94] Ibid. Table 2, p. 256.

[95] For example, Peter Bein, Environment Canada (personal communication with Ronald Colman, 2000), indicated that Costanza's assumptions are highly conservative, and that a more accurate valuation would assess ecosystem services very much higher.

[96] Ibid.

[97] Jahoda, Marie. l982. *Employment and Unemployment: A Social-Psychological Analysis*. London. Cambridge University Press.

[98] In l998 Jolene Molitoris, the Federal Railroad Administrator for the U.S. Department of Transportation, spoke before a Senate Committee on Commerce and Science, and a Transportation Subcommittee on Surface Transportation and Merchant Marine. She warned that the "enormous restructuring" of the railroads in the U.S. "raised issues of safe operation." While rail traffic has expanded, the numbers employed by the railroads have fallen to the lowest in a century — and in 1998 stood at about half the employment numbers in l980. "Not surprisingly," said Molitoris, "operations on these huge systems have dramatically increased fatigue in employees and supervisors, increased the complexity of communications, and created other human factor safety hazards." Molitoris pointed to the relationship between shift work and fatigue, and concluded that "advancing safety initiatives against fatigue and other hazards throughout an industry of 265,000 employees and 220,000 miles of track, 280,000 highway-rail crossings, 20,000 locomotives and more than a million cars, is a daunting but absolutely essential task." From Molitoris, Jolene. l998. *Fatigue in Rail and Truck Operations*. Congressional Testimony. Washington. http://www.elibrary.ca.

[99] Marchant, Valerie. l999. "In the Deep of the Night: The New Economy is Making more Companies Confront the Challenges of Unorthodox Hours." *Time Magazine*. November 11. p. 110.

[100] Available from numerous sources including CNN. "Lack of Sleep America's top health problem, doctors say." http://www.cnn.com/HEALTH/9703/17/nfm/sleep.deprivation/; Canada Safety Council. Fatigue. http://www.safety-council.org/info/OSH/fatigue.htm.

[101] Goetzel, Ron (ed), May/June 2001. "The Financial Impact of Health Promotion." *American Journal of Health Promotion*. 15: 5.

[102] Shields, Margot, Autumn 1999. "Long Working Hours and Health," Statistics Canada, *Health Reports,* 11. 2: 33–48.

[103] Sokejima, S. and S. Kagamimori. 1998. "Working hours as a risk factor for acute myocardial infarction in Japan: Case Control Study," *British Medical Journal*. 317: 775–780.

[104] Statistics Canada, Canadian Centre for Justice Statistics, *A One-Day Snapshot of Inmates in Canada's Adult Correctional Facilities*. Catalogue no. 85-601. p. 120. For Canada, the "Snapshot" shows 55% of provincial prisoners and 43% of federal prisoners unemployed at the time of admission.

[105] Please see the GPI Atlantic work hours report available at http://www.gpiatlantic.org/pdf/workhours/workhours.pdf for details on the methods, assumptions, data sources, and research underlying each of the cost estimates. In the GPI Paid Work Hours report, cost calculations have been made in relation to both a hypothetical 0% unemployment rate (full employment) and a 3.5% base rate. However, the calculations cited here are for the more conservative 3.5% base rate only. For more information and a step-by-step summary of the methodology used in the calculations please refer to the original GPI report cited above.
[106] Alcohol abuse is also a major behavioural risk factor, especially in Bhutan. However, it is not included as an example here because the National Statistics Bureau is planning to shortly release a report on alcohol abuse and the costs of alcohol abuse in Bhutan. The costing methodology and policy implications will be included in that report.
[107] The World Bank. 1999. *Curbing the Epidemic: Governments and the Economics of Tobacco Control.* The World Bank, Washington, D.C., p. 1.
[108] Health Canada. 1999. "Deaths in Canada due to Smoking," *Information Sheet,* Ottawa; Health Canada, 1999. *Toward a Healthy Future: Second Report on the Health of Canadians,* Ottawa.
[109] Health Canada, *Toward a Healthy Future,* p. 25; Health Canada, 1999. *Statistical Report on the Health of Canadians,* Ottawa, p. 308; National Cancer Institute of Canada. 2000. *Canadian Cancer Statistics 2000,* Toronto.
[110] Canadian Fitness and Lifestyle Research Institute, *The Research File,* 2000, Reference No. 00-01.
[111] Andrews, Gary, "Promoting Health and Function in an Ageing Population," *British Medical Journal*, 24 March, 2001, 322. 7288: 728–729.
[112] Fries, James, 1996, "Physical Activity, the Compression of Morbidity, and the Health of the Elderly," *Journal of the Royal Society of Medicine*, 89, pp. 64 and 67.
[113] Statistics Canada. *Health Indicators: Definitions and Data Sources: Body Mass Index (BMI-Canadian Standard)*, Health Canada, Statistics Canada, 2001; http://www.statcan.ca/english/freepub/82-221-XIE/00401/defin1.htm.
[114] WHO Expert Consultation Group. 2004. "Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies." *Lancet*, 363: 157–63.
[115] Romero-Corral, A., V.K. Somers, J. Sierra-Johnson, R.J. Thomas, M.L. Collazo-Clavell, J. Korinek, T.G. Allison, J.A. Batsis, F.H. Sert-Kuniyoshi, and F. Lopez-Jimenez. 2008. "Accuracy of Body Mass Index in Diagnosing Obesity in the Adult General Population," *International Journal of Obesity*, 32: 959–966.
[116] Connor Gorber, S., M. Tremblay, D. Moher, and B. Gorber. 2007. "A Comparison of Direct Vs. Self-Report Measures for Assessing Height, Weight and Body Mass Index: A Systematic Review," *Obesity Reviews*, 8: 307–326.
[117] Shields, Margot, Sarah Connor Gorber, and Mark S. Tremblay. 2008. "Effects of Measurement on Obesity and Morbidity," *Health Reports*, Statistics Canada, Catalogue no. 82-003-X, 19, 2: 1-8. http://www.statcan.ca/english/freepub/82-003-XIE/2008002/article/10564-en.pdf.
[118] Ibid.
[119] Flegal, Katherine M., Barry I. Graubard, and David F. Williamson. 2005. "Excess Deaths Associated with Underweight, Overweight, and Obesity," *JAMA - Journal of the American Medical Association*, 293, 15: 1861–1867.
[120] Rockhill, Beverly, Beth Newman, and Clarice Weinberg. 1998. "Use and Misuse of Population Attributable Fractions," *American Journal of Public Health*, 88, 1: 15–19.
[121] Ibid. p. 16.
[122] Government of Nova Scotia, media release, "Official launch of Select Nova Scotia," 5 July, 2007. http://www.gov.ns.ca/news/details.asp?id=20070705004.