

Beyond GDP: Classifying Alternative Measures for Policy-Making

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Abstract

Both the potential pitfalls of macro-economic policies focused on stimulating economic growth and the problems involved in using GDP as a measure of well-being or economic welfare have long been recognized by economists and researchers from other social sciences. Therefore, it is no surprise that alternative measures for policy-making have been developed and promoted since the early 1970s. Over the past five years, the development of these measures has gained momentum both politically and academically. However, most research efforts concentrate on the development and promotion of individual indicators, while paying less attention to the wide range of indicators already available and to theoretical insights. As a result, few classification schemes of alternative measures exist today to help policy-makers in selecting a proper set of indicators. This paper first looks into the different classification schemes available in the literature and outlines the weaknesses in each of these. Afterwards, an alternative classification scheme is introduced that draws on the notions of well-being, economic welfare and sustainability. A further subcategorization is built on the different approaches that are used to quantitatively capture the notions. By focusing on the underlying concepts that the different measures aim to quantify, the alternative classification scheme overcomes the drawbacks of the existing schemes. Finally, 23 alternative measures for policy-making are reviewed and organized into the newly developed classification scheme.

1. Introduction

Achieving economic growth, as measured by an increase in Gross Domestic Product (GDP), has been one of the main goals of macro-economic policymaking over the last fifty years. National economic policies generally include a wide range of measures to stimulate economic activities, ranging from optimizing taxes to facilitating markets and trade to investing in public infrastructure and education. However, concerns about both the desirability and the sustainability of continued economic growth have increased over the years. The criticisms raised can be related to three central issues (Bleys, 2009): well-being (the economy is a means, not an end), economic welfare (good growth versus bad

growth) and sustainability (acknowledgement of the physical limits to growth). The concerns raised at the economic growth objective resulted in similar criticism of the use of GDP as the normative benchmark for economic and even social performance. Van den Bergh (2009) can be consulted for a comprehensive review of the criticisms on GDP.

The problems involved in using GDP as a measure of well-being or economic welfare have long been recognized by economists and researchers from other social sciences. Therefore, it is no surprise that alternative measures for policy-making have been developed and promoted since the early 1970s. Over the past five years, the development of these measures has gained momentum as the “Beyond GDP” movement found its way to policy-makers and statistical offices. At the “Beyond GDP” conference organized by the European Commission in November 2007, a strong political statement was made. Both José Manuel Barroso, President of the European Commission, and Stavros Dimas, Commissioner for the Environment, called for the development and further improvement of indicators that adjust, complement or replace GDP. In January 2008, the Commission on the Measurement of Economic Performance and Social Progress was created on the initiative of the French government. Twenty months later the Commission delivered its final report that has become widely known as the Stiglitz-Sen-Fitoussi report. Finally, the OECD launched its ‘Measuring the Progress of Societies’ website¹ in October 2009 to allow “Beyond GDP” practitioners to share and discuss their experiences with alternative measures.

The growing interest in the “Beyond GDP” ideas has resulted in an explosion of alternative measures available for policy-making over the last 10 years. In an extensive review of composite indicators measuring country performance, Bandura (2005) reported a growing trend in both the quantity of indices available and the variety of issuing institutions (either public or private). Bandura found that approximately 80% of the indices in the study had been elaborated in the 1991-2005 period, and that almost half of all indices available in 2005 were developed after 2000. The author also noted that the issues covered by the indices have broadened and moved away from traditional topics such as sovereign risk and economic issues to also include gender aspects, environmental performance, corruption, globalization and competitiveness. In a 2008 update, 43 indices were added to the inventory of alternative measures (Bandura, 2008).

Most research efforts on composite indicators, however, concentrate on the development and promotion of individual indicators, while paying less attention to the wide range of indicators already available and to theoretical insights. As a result, few classification schemes of alternative measures exist today. This is a significant drawback given the large number of alternative measures that are currently available and the need of policy-makers to select a limited number of measures in the evaluation of different policy choices. The development of a comprehensive classification scheme is thus a worthwhile effort. It assists policy-makers in selecting a set of alternative indicators by indicating which measures should be regarded as ‘competitors’ and which as ‘complements’.

¹ <http://www.wikiprogress.org/>

Furthermore, a proper classification scheme helps to bridge the gap between theory and practice when it comes to developing alternative measures for societal progress.

This paper first looks at the different classification schemes available in the literature to date (section 2). After pointing out the limitations of these schemes, a new classification scheme for alternative measure for policy-making is introduced in section 3. The new scheme builds on the notions of well-being, economic welfare and sustainability that are central in the critical analysis of the economic growth objective. The aim of the classification scheme is to organize different indicators and indices that focus on a country's economic social and/or environmental performance. In section 4, a total of 23 alternative indicators related to the "Beyond GDP" literature are placed in the newly developed classification scheme. Indicators and indices are selected using 3 criteria: they need to (a) monitor changes at the country-level, (b) be internationally comparable and (c) compiled for different points in time. Finally, section 5 concludes the paper.

2. Existing Classification Schemes

Some surveys on alternative measures for societal progress use very random ways to organize the indicators included. In Bandura (2008), for instance, the 178 composite indices measuring country performance included in the inventory, are listed alphabetically. Another example can be found in Hagerty et al. (2001): when reviewing different quality-of-life indices for national policy, the authors arranged the indices according to the number of quality-of-life related domains that were included in each index.

Other studies develop more elaborated frameworks to organize the indicators and indices that have been put forward over the years. The existing classification schemes for alternative measures for policymaking can be divided into two categories. A first category focuses on the *origins* of the different indicators in terms of the academic research fields in which they were developed (section 2.1). The second category looks at the main *objectives* for which the indicators were developed (section 2.2). Here, reference is made to the intended use of the indicators with regard to the Gross Domestic Product (GDP). Both categories are critically analyzed in section 2.3.

2.1 Origins

In the origin-based classification scheme worked out by Offer (2003), the alternative measures are categorized into three classes:

- *Extended economic accounts*
As the traditional national accounts fail to provide a proper measure of well-being, *economists* have tried to extend these accounts by including social and environmental information and build adjusted measures of human well-being based on the notions of sustainability and sustainable income.
- *Social indicators*

From the 1960s onwards, *sociologists* have put forward several alternative measures of well-being inspired by the idea that well-being cannot be fully captured by monetary indicators.

- *Psychological indicators*
More recently, *psychologists* have started to employ a more direct approach to measure well-being by reaching into the individuals' personal experiences of welfare (subjective well-being).

In an assessment of the adequateness of GDP as a proxy for well-being carried out for the OECD, Boarini et al. (2006) employ a similar classification scheme. Alternative measures are grouped into three categories: monetary measures of economic resources, measures reflecting selected social conditions and subjective measures of happiness and life satisfaction.

Diener and Suh (1997) use a similar scheme to classify different measures of quality-of-life, yet they relate the different categories of measures to the philosophical approaches to conceive well-being used by the different research fields. Economists start from the idea of preference satisfaction through consumption to build income-related measures, sociologists mostly start from a set of normative ideals to quantify well-being, while psychologists tend to look at the subjective experience of individuals. This approach to the classification of alternative measures is insightful, and it will be extended in section 3.1, where the categorization of well-being measures is reviewed.

2.2 Objectives – Relation to GDP

In a review of the existing alternative measures of progress conducted on behalf of the European Parliament, Goossens et al. (2007) divide the measures into three categories based on their main objectives:

- *Indicators adjusting GDP*
The first category includes traditional economic performance indicators such as GDP or national savings rates that are adjusted by including monetized environmental and social factors.
- *Indicators replacing GDP*
This category contains indicators that try to assess well-being more directly than GDP, for instance by assessing average life satisfaction or the achievement of basic human functions.
- *Indicators supplementing GDP*
The final category of alternatives includes indicators that complement GDP with additional information on the environment and social conditions, either by the creation of satellite accounts or by relating GDP to other social and environmental indicators (e.g. comprehensive indicator sets).

Keune et al. (2006) propose a similar objective-based approach and distinguish between complementing, corrective and transformative indicators of human welfare.

Complementing indicators complete GDP by looking beyond traditional economic indicators and including ecological and social components. Corrective indicators have a

similar intention, yet they generally adjust GDP figures in order to account for these components. Transformative indicators are indicators that focus primarily on human and natural values in the assessment of human welfare, rather than the monetary values that are mostly used in traditional assessments.

In a background paper for the Commission on the Measurement of Economic Performance and Social Progress, Afssa et al. (2008) employed a classification scheme that is closely linked to the objective-based one. The authors explore the alternative approaches to measuring societal progress starting from the closest to traditional statistics (System of National Accounts - SNA) and moving progressively towards the most remote from the traditional approach. The indicators are divided into five categories: (a) GDP and other indicators linked to the SNA, (b) dashboards or sets of indicators, (c) corrected income measures and extended national accounts, (d) non-monetarily aggregated composite indicators and (e) subjective approaches.

2.3 Critical Analysis

While both the origin-based and objective-based classification schemes have their merits, they also have their drawbacks. For one, the origin-based approach tends to oversimplify the current state-of-the-art in human well-being research, as it ignores the increasing level of interdisciplinarity in the different research fields. For instance, quite a few happiness studies are carried out nowadays by economists (e.g. Layard, 2005). A second problem with the origin-based approach is that it tends to overlook indicators of sustainable development and sustainability. The objective-based approach on the other hand puts too much emphasis on GDP, while it is widely agreed upon that this indicator does a poor job in capturing either human well-being or economic welfare.

More importantly, both classification schemes group indicators that aim to quantify fundamentally different concepts. For instance, both the Ecological Footprint and the Human Development Index are included in the objective-based approach as 'replacements' for GDP (Goossens et al., 2007), yet the first is a measure of sustainability, while the second can be regarded as a measure of well-being. In the next section, a new substance-based classification scheme is introduced. By focusing on the underlying concepts that the different measures aim to quantify, the alternative classification scheme overcomes the drawbacks of the existing schemes.

3. A New Substance-Based Approach

A better way to classify the alternative measures for policy-making can be derived by looking at the underlying concepts that these measures aim to quantify. The notions of well-being, economic welfare and sustainability that emerged from a comprehensive analysis of criticisms on GDP (Bleys, 2009) can be useful to make a top-level categorization:

- *Well-Being*

Measures of well-being aim to comprehensively evaluate either a single person's life situation or the life situation of a group of people. These measures are multi-dimensional by nature and can be linked to different theoretical conceptualizations of well-being.

- *Economic Welfare*
Measures of economic welfare capture the contribution of a nation's economy to the overall level of well-being enjoyed by its citizens. They can thus be regarded as measures of the economic dimension of well-being.
- *Sustainability*
Measures of sustainability investigate whether the current levels of well-being and economic welfare can be sustained into the future.

The substance-based classification scheme will be elaborated throughout the remainder of this section. The notions of well-being (section 3.1), economic welfare (3.2) and sustainability (3.3) are examined in greater detail and the different methodological approaches to measuring these notions are presented. These methodological approaches will allow for a further sub-categorization of the different measures. Section 3.4 looks at the differences between the newly developed scheme and the approach used in the Stiglitz-Sen-Fitoussi report, while section 4 lists a number of alternative measures for policy-making and organizes these measures into the substance-based classification scheme.

3.1 Well-Being

Well-being is a rather vague concept that is hard to define. In general, the concept of well-being can be linked to the assessment of a person's life situation in the broadest way possible (Gasper, 2004). A series of other terms is also being used to describe such an assessment: quality-of-life, happiness, life satisfaction and welfare are the most recurrent ones. Unfortunately, no comprehensive framework that links these concepts has been worked out in the literature and, to complicate things even further, the different terms are being used inconsistently. However, it is clear that well-being is a multi-dimensional concept, encompassing a wide diversity of elements. As a result, a proper measure of well-being should look at a wide range of well-being dimensions.

In the new classification scheme put forward in this paper, the measures of well-being are categorized according to two dimensions: the measurement technique used in the data collection process and the theoretical conceptualization of well-being on which the methodological framework of the measure is built. In figure 1, the most widely used measures of well-being are organized into the newly developed classification scheme. These indicators and indices are discussed in greater detail in section 4.1.

Objective versus Subjective Measures

Two different approaches to measuring well-being are often opposed to one another: the objective approach and the subjective approach (e.g. Conceição and Bandura, 2008). The objective approach looks at 'harder' data, such as income per capita or gross enrollment

ratios, while the subjective approach considers 'softer' matters, such as an individual's satisfaction with income and his perceived adequacy of educational opportunities. The objective approach can be connected to the tradition of compiling social statistics, while the subjective approach stems from survey research (Veenhoven, 2002). Policy-makers often use a single contrast between subjective and objective measures of well-being, yet this tends to oversimplify. In the literature on this subject, several distinctions are made to classify measures of well-being.

For instance, in separating subjective measures from objective ones, Veenhoven (2002) distinguishes between the substance and the assessment of a measure. The substance relates to the question of what is being measured, while the assessment refers to the actual process of collecting the data. Measures are said to be objective when they are concerned with things that exist independent of subjective awareness and when the measurement is based on explicit criteria and performed by external observers. Subjective indicators measure subjective substances (for instance identity, happiness and trust) using subjective appraisal techniques such as self-reporting. Note also that there exist cases in which Veenhoven would speak of 'mixed measures'. In more recent work, Veenhoven (2004) uses a more refined (3x3) classification that considers an intermediate position in each of the dimensions.

Conceptualizations of Well-Being

Even if the concept of well-being itself is hard to define, different conceptualizations are available from the literature on philosophy. These conceptualizations can be used to quantitatively capture the concept of well-being. Many different conceptualizations exist, yet the most important ones are utilitarianism (including both the 'revealed preferences' approach and the happiness approach), the fulfillment of human needs (including sustainable development) and capabilities and functionings. Each of these conceptualizations will be briefly reviewed next. Gasper (2004) can be consulted for an extensive review of these conceptualizations.

Utilitarianism is one of the cornerstones of economic theory. It assumes that the choices between different options to allocate scarce resources are made using a preference ordering that is represented by a utility function. The utility function can depend on commodity bundles, or services, or social states. The utilitarian stance on economics centers on achieving the 'greatest good for the greatest number' in that utility should be maximized over all persons. Economists have long tried to numerically capture the concept of utility. Two conceptions of utility have been developed: the ordinal conception and the cardinal conception. The ordinal conception is based on rankings and has resulted in the behaviorist, or revealed preferences, interpretation of choice theory. Under certain assumptions, this conception supports the idea that observed consumption can be used to measure well-being. The cardinal conception of utility looks at personal experiences and facilitates the happiness interpretation of utility. It can be used as a starting point for subjective individual or utilitarian indicators that generally look at what a person is feeling in terms of utility, pleasure, desire or needs fulfillment, happiness.

Whereas utility is only concerned with the mental reaction to aspects of life, the *human needs* approach looks at the actual fulfillment of human needs, mostly through the provision of commodities. Some of the human needs approaches look specifically at the fulfillment of basic human needs, while others employ a broader scope and include non-basic human needs. The (basic) human needs approach is heavily inspired by John Rawls, who considers the provision of ‘primary social goods’ as the foundation of wellbeing. Primary goods are “things that every rational person is presumed to want” (Rawls 1971) and include basic rights as well as economic and social advantages. Practical applications of the (basic) human needs approach typically involve a listing of needs and corresponding satisfiers. As a result, many lists of (basic) human needs exist in the literature. Some of these lists are hierarchical in that certain needs need to be satisfied first before focusing on higher-level needs, while others are non-hierarchical and put all human needs on the same level. Alkire (2002) and Gasper (2005) can be consulted for an extensive review of different lists of (basic) human needs. When current well-being is linked to the needs of future generations, the ideas of ecological sustainability and development are combined into a new vision on society (*sustainable development*). As this concept commonly focuses on the needs of both the present generation and future generations, it was decided to look at sustainable development indices as a subgroup of well-being measures that is linked to the human needs approach. It should however be noted that combining the ideas of development and sustainability into one single index has attracted criticism over the years, as the issues affecting current well-being need not affect sustainability and vice versa (Neumayer, 1999).

In the early 1980s, Sen (1985) worked out the *capabilities-functionings* approach. An individual’s level of well-being is evaluated based on what he manages to do or be. The approach focuses on two levels: the level of observed outcomes (achieved functionings) and the level of opportunities (capabilities). What an individual is really doing or being is called his achieved functionings, whereas all possible functionings that an individual can achieve are referred to as his capabilities. Capabilities should hence be seen as opportunities or potential functionings. While the multi-dimensional framework of the capability approach is generally regarded as a considerable enrichment for policy analysis, there is no consensus about how to define the most adequate multidimensional space. Should all capabilities be included in a list, and if so, should one use equal weights? Or should one focus on a limited list of essential capabilities? How can such a list of functionings and capabilities be compiled? Schokkaert (2007) identifies two “extreme” approaches to this problem. The first one starts from an openly normative view on what constitutes human flourishing and defines a list of abstract essential capabilities based on this a priori view. These abstract capabilities will subsequently be converted into a list of implementable indicators considering the specific social, cultural and economic context (e.g. Nussbaum, 2000). In the second approach, the definition of the list of capabilities is deliberately left open and has to be settled in a democratic process through public reasoning (e.g. Sen, 2004).

3.2 Economic Welfare

As we have seen throughout the previous section, well-being is a multi-dimensional concept that is difficult, if not impossible, to capture in a single number. It is, however, possible to monitor and analyze different aspects of well-being separately. Such analyses will provide useful information that can be used in the development of effective policy measures.

In the new classification scheme, the term 'economic welfare' is used to refer to the contribution of a nation's economy to the overall level of well-being enjoyed by its citizens. Economic welfare can thus be seen as the economic dimension of well-being. Monitoring the level of economic welfare over time involves distinguishing between the costs and benefits of the economic process. This distinction is essential if one wants to talk about economic welfare rather than physical scale, yet it is also “inherently difficult and somewhat subjective and arbitrary” (Costanza et al., 2002).

The services derived from consumption are widely considered to be the main benefits from economic activities. Yet, in valuing these benefits, several important issues need to be addressed (e.g. proper distinction between intermediate goods and final goods, acknowledgement of defensive expenditures, deciding on which boundaries to use when looking at consumption, etc). The costs associated with economic activities are mostly linked to the natural environment: the depletion of natural capital, the proper disposal of wastes and the loss of ecosystem services due to environmental degradation.

The most widely used measures of economic welfare are reviewed in section 4.2. The different indicators are presented in figure 2, in which they are clustered according to the different conceptualizations of income that underlie their methodologies. A second parameter that is used to discriminate between the different measures of economic welfare is linked to whether the measures include adjustments for environmental issues.

Income Concepts

The concept of income is mostly used to quantitatively capture economic welfare, yet some exceptions exist (e.g. the Index of Economic Well-Being developed by Osberg and Sharpe, 2002). Different definitions of income have been developed over the years: economic income, sustainable income and psychic income. Each of these conceptualizations can be used to keep track of changes in economic welfare.

Economic income is defined as the gross income generated by all marketed economic activities. Measuring economic income involves summing the incomes accruing from production. As such, economic income is closely linked to the level and pattern of goods and services produced within the nation's economy. Measuring economic income is the main objective of the System of National Accounts (SNA), the economic accounting system that has been developed in almost every single country in the world. These accounts allow for the calculation of the Gross Domestic Product (GDP), which is by far the most widely used indicator of economic welfare.

Measures of *sustainable income* attempt to incorporate changes in capital stocks. The central criterion to define the concept of sustainable income has been put forward by Hicks (1939): “We ought to define a man’s income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning”. The same logic holds at the national level and for annual time periods. Samuelson (1961) argues that, as the concept of sustainable income keeps track of the economy’s current power to consume if it wishes to do so, it can be defended by anyone who believes that consumption is the ultimate end of economic activity. Generally two capital stocks are considered: human-made capital and natural capital. Changes in human-made capital are relatively easy to calculate, as data on this stock are readily available from the national accounts. Determining the monetary value of changes in marketed and non-marketed natural capital stocks is, however, more difficult. The sustainable income concept has been operationalized in different ways: measures of sustainable income are generally divided into two categories according to whether they focus on the notion of weak sustainability or that of strong sustainability (Neumayer, 2003). The former allows for the substitution of natural capital by human-made capital, while the latter does not.

Fisher (1906) defines income not as the amount of goods and services produced or consumed in a particular year, but as a psychic flux of services derived from the consumption of these goods and services (*psychic income*). Services are ultimately psychic, subjective satisfactions in the stream of consciousness of a human being that result from his or her consumption. Fisher also recognized disservices and negative psychic sensations, from labor, pains or other discomforts. Whereas Fisher’s concept of capital - the idea that it embraces all stocks of material objects that yield services to human beings - has been widely accepted over the years, his conceptualization of income remains controversial to this day (Tobin, 2005). One obvious disadvantage of this conceptualization of income is its lack of practicality. How should one capture this flux of services? As this question has mostly remained unanswered, Fisher’s concept of income has had limited impact on the measurement of income (Farley et al., 2002). However, some economists have recently turned to the psychic income concept to construct comprehensive measures of economic welfare. For instance, Lawn (2003) worked out a sound theoretical framework for the Index of Sustainable Economic Welfare (ISEW) and several related measures based on the income concept of Fisher.

Adjustments for Environmental Issues

A second parameter that is used to discriminate between the different measures of economic welfare is linked to whether the measures include adjustments for environmental issues. Is natural capital depletion taken into account? Do the indicators look at the impact of environmental degradation on ecosystem services and the health of a population? It is important that measures of economic welfare do include such adjustments, as the difference in the treatment of human-made and natural capital “reinforces the false dichotomy between the economy and the ‘environment’ that leads policy makers to ignore or destroy the latter in the name of economic development” (Repetto et al., 1989).

3.3 Sustainability

Sustainability, in a general sense, is defined as the ability to maintain a certain process or state. The concept of sustainability applies to all aspects of human life and is commonly defined within ecological, social and economic contexts. With regard to well-being, the sustainability debate focuses on whether the current level of well-being can be experienced for the foreseeable future. An important feature in this debate is ecological sustainability, which relates to the ability of ecosystems to maintain ecological processes, functions and productivity into the future. Next to ecological sustainability, the notion of economic sustainability has become central in country performance analyses, especially after the financial crisis of 2007 (Stiglitz et al., 2009).

Measures of sustainability typically assess long-term changes in capital stocks. They need to be linked to specific criteria or rules that allow users to determine whether the current level of well-being can be maintained over time. In the SESA-2003 (UN, 2003), three approaches to sustainability are presented: the three-pillar approach, the ecological approach and the capital approach. These approaches are used to differentiate between the various measures of sustainability (see figure 3). The most widely used measures of sustainability are reviewed in section 4.3. The remainder of this section looks into the different approaches and reveals the partial overlaps between them. For each approach, possible sustainability rules are presented.

Three-Pillar approach

A widely held view on sustainable development is that it refers to the integration of three interdependent systems or ‘pillars’: society, the economy and the environment. According to this view, there must be no single object of sustainability, but instead all of the economic, social and environmental systems must be simultaneously sustainable in and of themselves. Satisfying any one of these three sustainability pillars without also satisfying the others is deemed insufficient, as the pillars are independently crucial and interconnected. As there is always a risk of unintentionally causing (or worsening) problems in one system while attempting to correct problems in another, the only sure way to avoid this is to integrate decisions in such a way that effects in all three systems are considered before action is taken.

As a result, the three-pillar approach - which is also known as the ‘triple bottom line’ approach - is wide-ranging and complex. The approach needs either a model of all interactions between the different systems, so that the impact of different policies can be investigated beforehand, or a set of indicators monitoring the different systems, so that the impact of policies can be analyzed. From a practical point of view, the first option is almost impossible, as the interactions between society, economy and the environment are complex and uncertain. Coming up with a set of sustainable development indicators is, although still challenging, more feasible. However, in order to determine whether or not the present state is sustainable over time, critical thresholds need to be defined for all indicators. These should be derived conform to society’s vision on sustainability.

Ecological Sustainability

The notion that economic and social systems are subsystems of the global environment is central to the ecological view of sustainable development. According to this view, sustainability in the economic and social spheres is subordinate to sustainability of the environment. Ecological sustainability refers to the maintenance of the dynamic capacity of ecosystems to respond adaptively to external perturbations and changes (also referred to as their 'resilience').

The ecological approach to sustainability implies measurement within two broadly defined categories. The first category includes measures of the pressures placed on ecosystems by human activities, such as the extraction of materials and energy, emissions of pollutants and human appropriation of space and ecosystem productivity. These pressures often cause reduced ecosystem health as manifested in degraded service flows. The second category includes measures of the ecosystems' responses to these external pressures. Four types of response measures can be distinguished (UN 2003). Individual indicators on environmental parameters are often organized into Pressure-State-Response (PSR) frameworks. Daly (1991) worked out basic rules that outline an ecologically sustainable limit to the environmental pressures imposed by the economic production process for renewable resources, non-renewable resources and pollutants. These rules can be used as a baseline in the assessment of ecological sustainability.

The ecological concept of carrying capacity can also be used to assess the pressures of human activities on the environment. Carrying capacity is the maximum population size that can be supported by a given set of resources. The carrying capacity of any given area is not fixed, as it can either be extended (e.g. by improved technology) or reduced (e.g. by pressures which accompany a population increase). As no population can live beyond the environment's carrying capacity for very long, the concept of carrying capacity has a built-in rule for assessing sustainability.

Capital Approach

The capital approach to sustainability is closely associated with the thinking of economists on the subject. According to economic theory, non-declining capital stocks are needed in order to sustain income flows over time (Hicks, 1939). Investments are generally regarded as a means to compensate for the depreciation of capital stocks, so that the non-declining capital stocks condition can be converted into a need for investments to exceed depreciation rates. The narrow focus on human-made capital is discarded, as other types of capital stocks (e.g. natural capital and human capital) are generally taken into account as well. Again, different ideas with regard to the substitutability between different types of stocks are the subject of a fierce debate (weak versus strong sustainability).

The weak sustainability assumption implies that the total capital stock should be maintained over time. Hamilton (1994) generalizes this rule: the total net capital

investment, or in other words the rate of change in the net capital wealth, should not be persistently negative. Total net capital investment includes gross investment in all forms of capital minus depreciation or capital consumption.

As strong sustainability is a more diffuse paradigm than weak sustainability, different rules that seek to operationalize it have been suggested. Neumayer (2003) identifies two main schools of thought. The first requires that the monetary value of natural capital is preserved over time and is closely linked to the ecological approach to sustainability. Natural capital depreciation should be balanced by investment in shadow projects. The second school of thought requires that a subset of natural capital is preserved in physical terms so that its functions remain intact. This strand is often called the critical natural capital approach. Defining critical natural capital is rather difficult, yet Dietz and Neumayer (2007) argue that one could ‘ring-fence’ as critical any natural capital that is strictly non-substitutable, the loss of which would be irreversible, would entail very large costs due to its vital role for human well-being or would be unethical.

3.4 Stiglitz-Sen-Fitoussi

The Stiglitz-Sen-Fitoussi report (Stiglitz et al., 2009) is divided into three major parts: classical GDP issues, quality-of-life and sustainable development and sustainability. The first part reviews the shortcomings of GDP as a measure of “economic well-being” and looks at possible solutions within the existing measurement framework of the national accounts. The next two parts look at alternative measures that provide an opportunity to enrich policy discussions. These measures are subdivided into 2 categories based on the substance of the indicators (quality-of-life and sustainable development), similar to the categorization in the classification scheme developed in this paper.

There are, however, important differences between both classifications. The most obvious one is the fact that the Stiglitz-Sen-Fitoussi report does not consider measures of economic welfare. In the introduction, the authors point to the fact that “GDP mainly measures market production, though it has often been treated as if it were a measure of economic well-being”, yet the concept of ‘economic well-being’ is not worked out in the report. In the text, reference is made to a UNECE/OECD/Eurostat (2008) document in which the determinants of economic well-being are outlined as those that are the most directly amenable to monetary evaluation. The Stiglitz-Sen-Fitoussi report focuses on quality-of-life (or well-being, section 3.1) and sustainable development and sustainability (section 3.3), yet the notion of economic welfare as outlined in section 3.2 is not discussed in greater detail. This is rather striking given that most economists and policy-makers would agree that GDP is not a good indicator of well-being nor one of sustainability, while there is less consensus on the fact that GDP is not a good measure of the economic dimension of well-being. One would expect that the concept of economic welfare and related indicators and indices would receive more attention in the Stiglitz-Sen-Fitoussi report, yet the report only deals with classical GDP issues.

As a result, most of the alternative measures of economic welfare (section 4.2) are classified as measures of sustainable development and sustainability. For instance, green

GDP, the Measure of Economic Welfare (MEW) and the Index of Sustainable Economic Welfare (ISEW) are grouped here as ‘Adjusted GDPs’. Stiglitz et al. (2009) correctly argue that these measures have a fundamental problem as indicators of sustainability in that they do not “characterize sustainability *per se*”: the measures adjust GDP for the depletion of natural capital and the damages of environmental degradation, yet this is only a partial answer to the sustainability question. The authors favor a stock-based approach to measuring sustainability combined with clear sustainability rules and hence suggest that indicators focusing on overconsumption or underinvestment should be used. In the alternative classification scheme put forward in this paper, green GDP, MEW and ISEW are regarded as measures of green economic welfare in that they measure the current contribution of a nation’s economic system to the overall level of well-being enjoyed by its citizens while taking into account the interactions between the economy and the environment.

4. Indicators

In this section, 23 indicators will be placed in the classification scheme put forward in section 3. Alternative indicators and indices focusing on a country’s economic, social and/or environmental performance are selected using 3 criteria:

- the measures need to monitor changes at the country-level (macro)
- the measures need to be internationally comparable: data sets have to exist for a series of countries
- the measures need to be compiled for different points in time: time series need to be available for each country

As a result, mostly composite indices are included in the classification scheme, as sets of indicators (e.g. sustainable development indicators) vary from one country to another. The indicators presented in this section are mostly related to the “Beyond GDP” literature. Section 4.1 lists measures of well-being, section 4.2 focuses on measures of economic welfare, while section 4.3 looks into different measures of sustainability.

4.1 Measures of Well-being

This section looks at a selection of the most widely used measures of well-being that have been developed over the past forty years. The indicators are presented in figure 2, in which they are separated according to two dimensions. The first dimension distinguishes between objective and subjective measures of well-being based on the technique that was used to collect the data. For reasons of simplicity, a single contrast between subjective and objective measures of well-being is used here. However, a third category is added in order to reflect that some indexes of well-being combine subjective and objective data in their methodologies. The second dimension takes into consideration the theoretical conceptualization of well-being that is implicitly or explicitly being used by the different measures.

GDP and Consumption Measures

GDP and other consumption-based measures can be regarded as measures of well-being if one assumes both that (a) the utility derived from consumption is the ultimate goal of individuals and (b) the level of utility derived as such is proportional to the amount of consumption. While there is a widespread consensus on the positive impact of income and consumption on well-being, an increasing number of studies indicate diminishing marginal returns of income on well-being above a certain threshold level (e.g. Max-Neef 1995; Layard 2005). Nevertheless, international organizations often use GDP figures to make cross-country comparisons of well-being or to categorize countries into different groups based on the achieved level of economic development.

Fulfillment of Hierarchical Needs Index

Clarke (2005) presents a measure of well-being that is built on the pyramid of human needs by Maslow (1943). The Fulfillment of Human Needs Index (FHNI) keeps track of the four deficiency needs (basic needs, safety needs, belong needs and self-esteem needs) in the pyramid by monitoring 2 indicators for each category of needs. The resulting eight indicators are normalized by dividing each year's figure by the highest figure occurring throughout the time series and weighted according to the hierarchy in Maslow's pyramid. Here, a simple linear progression is used: basic needs are weighted least (x1), safety needs are weighted as twice as important (x2), belong needs three times as important (x3) and self-esteem needs four times as important (x4). The self-actualization needs are seen as the ultimate goal (well-being) and will depend on the actual attainment of various hierarchical components. Clarke et al. (2006) argue that it is necessary to consider multi-dimensional human needs and motivation when analyzing and seeking to improve well-being through economic and social activities.

(Weighted) Index of Social Progress

Estes (1984) also uses the theory of human needs to build an objective measure of well-being: the Index of Social Progress (ISP). The index was designed to serve as a reliable tool for assessing shifts in the capacity of nations to provide for the basic needs of their populations and to facilitate the analysis of welfare-related data at regular intervals. In the updated methodology (Estes, 1997) for the Weighted Index of Social Progress (WISP), 40 social indicators are aggregated into 10 sub-indexes before arriving at the final index. The subcategories of the ISP are: education, health status, women status, defense effort, economy, demography, geography, political participation, cultural diversity and welfare effort. The statistical weights for the aggregation are derived through a two-stage varimax factor analysis in which each indicator and sub-index is analyzed for its relative contribution toward explaining the variance associated with changes in social progress over time. Estes (1997) argues that the WISP is a more comprehensive, valid and reliable instrument for assessing changes in social development over time than any of the other indexes on national and international progress.

Calvert-Henderson Quality-of-Life Indicators

A collaborative effort between Hazel Henderson, a pioneer in the field of sustainable development, and the Calvert Group, an asset management company specialized in socially responsible investing, resulted in the development of the Calvert-Henderson

quality-of-life indicators². The methodological framework of the indicator set was created by a multi-disciplinary group of practitioners and scholars from government agencies, businesses, and nonprofit organizations. The Calvert-Henderson quality-of-life indicators use a systems approach to investigate the dynamic state of the social, economic and environmental aspects of quality-of-life. The different indicators in the model are divided into 12 intertwined dimensions: education, employment, energy, environment, health, human rights, income, infrastructure, national security, public safety, recreation and shelter.

Sustainable Society Index

The Sustainable Society Index (SSI) created by Van de Kerk and Manuel (2008) integrates the most important aspects of sustainability and quality-of-life in a single index that consists of 22 indicators. The index is based on an extension of the Brundtland definition of sustainable development that explicitly includes the social aspects of human life. The indicators are grouped into 5 categories: personal development, clean environment, well-balanced society, sustainable use of resources and a sustainable world. For each of the 22 indicators, the authors set sustainability values (ultimate targets for an ideal sustainable world) and the distance between the actual situation and the sustainability value is transformed in a value between 0 and 10. Within each category of items, the different indicators are then equally weighted. To calculate the overall SSI for a given country, the categories with an emphasis on sustainability get a larger weight than the ones focusing on quality-of-life. The authors use data from scientific institutes and international organizations to calculate the SSI for over 150 countries. The SSI was first published in 2006 and is updated every two years. Results can be found on the website of the Sustainable Society Foundation³.

Human Development Index

The Human Development Index (HDI), advanced by the United Nations Development Programme (UNDP), is probably the best-known composite index of well-being. The index keeps track of three dimensions that are considered to be the basic capabilities central to human development (with between brackets the indicator or indicators that are being used for each dimension):

- a long and healthy life (life expectancy at birth)
- knowledge (adult literacy rate and gross enrollment ratio)
- a decent standard of living (GDP per capita - in PPP USD)

Before the HDI itself is calculated, an index is created for each of these dimensions. To calculate these indexes, minimum and maximum values (goalposts) are chosen for each underlying indicator. Performance in each dimension is subsequently expressed as a value between 0 and 1. The HDI is then simply calculated as the average of the three dimension indexes. The HDI was first calculated in 1990. More recently, UNDP has developed some additional indexes in order to reflect poverty and gender inequalities. The Human Poverty Index (HPI) measures deprivations in the three basic dimensions of human development as captured in the HDI, while gender inequalities are highlighted in

² <http://www.calvert-henderson.com/>

³ <http://www.ssfindex.com/>

the Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM). Each year, the HDI rankings of most of the UN countries are published in the Human Development Report⁴.

Physical Quality-of-Life Index

In the mid 1970s, Morris (1979) developed the Physical Quality-of-Life Index (PQLI) in an attempt to provide a more accurate measure of well-being than the monetary indicators used at that time. The index is a single number derived from basic literacy rate, infant mortality, and life expectancy at age one, all equally weighted. For each indicator, the performance of individual countries is rated on a scale of 1 to 100, where 1 represents the worst performance by any country and 100 the best performance. The index enables researchers to rank countries, not by incomes, but by changes in real life chances (or capabilities, as Sen later called them). As such, the PQLI is commonly regarded as the blueprint for the Human Development Index.

Happiness / Life Satisfaction

Measures of happiness or life satisfaction aim to capture the cognitive and affective reactions of different persons to their specific life situations. They do so by directly asking people how satisfied they are with their lives through different types surveys. Satisfaction with life is generally measured on a 1 to 10 point scale (1 = very dissatisfied and 10 = very satisfied), yet many different formats of questions exist. Aggregated measures (e.g. for countries) are obtained by taking the average of the different scores over a group of people. The higher the mean value of life satisfaction in a country, the more satisfied a nation's population is with the general living conditions. The main source for life satisfaction data is the World Happiness Database⁵, which holds data from numerous national and international surveys. The best-known international studies on life satisfaction include the Eurobarometer (conducted on a yearly basis on behalf of the European Commission since 1973), the Latinobarometer and the World Values Survey⁶.

Human Needs Assessment

In an attempt to quantify the matrix of human needs in the Human Scale Development model, Max-Neef (1992) addresses human welfare more directly from an ends perspective by involving people in interactive dialogues to perform a Human Needs Assessment (HNA). The key idea is that humans do not have needs for products of the economy; the economy is only a means to an end (the satisfaction of primary human needs). For instance, food and shelter are ways of satisfying the need for subsistence. Max-Neef suggests that primary needs are finite, few and classifiable and that these needs do not change over time, yet it are the means by which these needs are fulfilled that change both over time and through cultures. Quantifying this Human Needs Assessment is, however, a very difficult task.

Happy Life Expectancy

⁴ <http://hdr.undp.org/en/>

⁵ <http://www2.eur.nl/fsw/research/happiness/>

⁶ <http://www.worldvaluessurvey.org/>

Veenhoven (1996) suggests measuring the apparent livability of a nation by the degree to which its citizens live long and happily. He operationalized this approach by combining data on life expectancy with survey data on subjective appreciation of life satisfaction. Life expectancy in years is multiplied by a rescaled 0-1 average happiness measure. The product is named Happy Life-Expectancy (HLE) and can be interpreted as the number of years the average citizen in a country lives happily at a certain time. Data on the HLE index are available for 67 countries in the 1990s (the number of countries covered continues to expand) and can be found on the World Happiness Database. Veenhoven underlines two important advantages of his approach. First, it clearly contains a subjective element, given that individuals' appraisal of life is acknowledged. Next, the concept of long and happy lives is relatively uncontroversial compared to most other notions of quality-of-life.

Happy Planet Index

The Happy Planet Index (HPI) was recently developed by the new economics foundation⁷ (nef), a UK-based independent think-and-do tank that conducts research on sustainable development and well-being. The index combines environmental impact with well-being to measure the environmental efficiency with which people live long and happy lives. As such, the HPI is an innovative measure that shows the ecological efficiency with which human well-being is delivered around the world. It does not reveal which are the 'happiest' countries, yet it reflects the relative efficiency with which nations convert the planet's natural resources into long and happy lives for their citizens. The exact methodology used to calculate the HPI can be found in Marks et al. (2006).

4.2 Measures of Economic Welfare

The most widely used measures of economic welfare are reviewed in this section. The different indicators are presented in figure 2 in which they are clustered according to the different conceptualizations of income that underlie their methodologies. One measure of economic welfare, the Index of Economic Well-Being, cannot be linked to a conceptualization of income. A second parameter that is used to discriminate between the different measures of economic welfare is linked to whether or not the measures include adjustments for environmental issues.

Gross Domestic Product

The Gross Domestic Product (GDP) keeps track of changes in the value of all final goods and services produced in a country in one year. It is calculated by summing the incomes accruing from production: the compensation of employees, the gross operating surplus (profits), the gross mixed income and the taxes less subsidies on production and imports. GDP is currently the most widely used measure of economic welfare. However, it fails to comply with the central criterion put forward by Hicks (1939). After all, it is not possible to consume a nation's entire GDP without undermining its ability to produce and consume the same GDP in the future for the obvious reason that some part of the annual

⁷ <http://www.neweconomics.org/gen/>

GDP has to be set aside to replace worn out capital. GDP is thus a measure of economic income, and not one of sustainable income.

Net Domestic Product

Many economists have acknowledged the added value of subtracting capital depreciation from GDP in order to account for a variety of defensive actions that maintain the effective capital stock (such as replacement, repair and maintenance). The resulting measure, the Net Domestic Product (NDP), is in line with Hicks' view on income as the maximum amount of goods and services that can be consumed without depleting capital stocks. The capital depreciation component in the NDP gives an idea about how much a country has to spend just to maintain its current GDP. Weitzman (1976) demonstrated that NDP is a good proxy for sustainable national income as it is proportional to the present discounted value of all future consumption. More recently, Atkinson et al. (1997) have shown that the Net Domestic Product as measured by national income statistics is theoretically equivalent to sustainable income. Yet, Costanza et al. (2002) argue that "some 'heroic' assumptions such as the inclusion of all forms of capital, investment and consumption in the national accounts" are needed in order for this equivalence to hold, given that the value of the depletion of natural resources and the degradation of the environment are ignored within this measure.

Environmentally Adjusted Net Domestic Product

The environmentally adjusted Net Domestic Product (eaNDP) is an environmental accounting aggregate that can be derived from the System of Integrated Environmental and Economic Accounting (SEEA). It is obtained by subtracting the costs of natural resource depletion and environmental degradation from net domestic product (NDP). The latest guidelines on the SEEA (UN 2003) review a number of valuation techniques for measuring environmental degradation and explore different approaches to make environmental adjustments to the flow indicators that can be derived from the national accounts (depletion, defensive expenditures and degradation). The eaNDP measure is listed as a measure of weak sustainable income in figure 2. Although adjustments to the NDP are made to factor in changes in natural capital and its ability to deliver important ecological services, changes in both the human-made and the natural capital stocks are added into a single number. As a result, substitution of one type of capital stock by the other is always possible.

Sustainable National Income

Sustainable National Income (SNI) is defined as "the maximum income for a given year that can be sustained with the technology of that year, given a specified standard for environmental sustainability, without assuming technological development except in respect of non-renewable resources" (UN et al., 2005). The concept was developed by Hueting (1995), who suggested using an absolute preference for conservation of the natural environment. Under this assumption, the value of environmental degradation is equal to the conservation costs (the costs necessary to preserve the environment and to remove the existing environmental burden). With the emphasis on resource conservation and the determination not to count revenues from resource depletion as income, the SNI can be categorized under the strong sustainability paradigm. The gap between SNI and

NDP measures the dependence of an economy on that part of its natural resource use that exceeds the sustainable exploitation level. Two steps can be distinguished when looking at the methodology of the SNI. First, sustainable resource use is defined (based on insights from natural sciences) and compared with actual resource use. Second, both direct and indirect changes in income caused by the required changes in resource use are calculated using an economic model (such as the Applied General Equilibrium model).

Measure of Economic Welfare

In the early 1970s, Nordhaus and Tobin (1972) constructed the Measure of Economic Welfare (MEW), a comprehensive measure of the annual real consumption of households, in an effort to explore the relation between GDP and the level of economic welfare. In the MEW, consumption includes all goods and services, marketed or not, valued at either market prices or at their equivalent in opportunity costs to consumers. Collective consumption is also included (as far as these expenditures are not considered as instrumental expenditures), and allowance is made for negative externalities: environmental damage, disamenities of congestion and urbanization, etc. The corrections can be divided into three categories: a reclassification of GNP final expenditures, imputations for capital services, leisure and non-market work, and disamenities of urbanization.

Economic Aspects of Welfare

A second attempt to develop a more comprehensive measure economic welfare was undertaken by Zolotas (1981) and resulted in the Economic Aspects of Welfare (EAW). The index was constructed to depict the full range of actual changes in a society's quantifiable well-being, regardless of whether or not these changes were the outcome of market transactions. The EAW index also starts with private consumption expenditures, while various other magnitudes are added or deducted according to whether they are positively or negatively related to economic welfare. Negative adjustments are made for expenses on consumer durables, advertising, the depletion of natural resources, the rapid growth and the rising social cost of environmental pollution, the cost of commuting and private health and education outlays. Positive corrections include services from the stock of public capital, services from durable consumer goods, household services, leisure time and public sector services (relating mainly to expenditure on education and health).

Index of Sustainable Economic Welfare

Building on the earlier efforts to measure economic welfare presented above, Daly and Cobb (1989) constructed the Index of Sustainable Economic Welfare (ISEW). Like the other welfare indexes, the ISEW starts with the personal consumption expenditures and adjusts this figure for such factors as income distribution, net capital growth, resource depletion, environmental damage and the value of unpaid household labor. The different welfare-related items are all expressed in monetary terms, before being aggregated into a single index, the ISEW. Over the years, the methodology of the ISEW was revised several times (e.g. Cobb and Cobb, 1994). New items were included in the framework and valuation methods were updated. Following Daly and Cobb's initial ISEW study on the United States, the index was calculated for many countries: Germany, the Netherlands, Sweden, the United Kingdom, Austria, Italy, Chili, Finland, Poland, France,

Thailand, Portugal and Belgium. The list of items included in the index and their corresponding valuation techniques differ slightly between different ISEW studies. Bleys (2009) can be consulted for an extensive review of the ISEW.

Genuine Progress Indicator

In 1995, Cobb et al. (1995) elaborated further on the ISEW framework to arrive at a new measure of economic welfare: the Genuine Progress Indicator (GPI). This measure adds a number of new categories to the ISEW: the value of volunteer work, costs of crime and family breakdown, loss of leisure time, the cost of underemployment and the cost of ozone depletion. Some of these items were also included in subsequent ISEW studies. The GPI is often regarded as a rebranding of the original ISEW, as the index only makes minor adjustments to the methodology of the ISEW. Cobb et al. (1995) felt a need to 'rebrand' the ISEW as they disliked the terminology of the index. The idea was to have a shorter and more accessible acronym, which specifically identified the index as a better indicator of national progress than the GDP (Jackson et al. 2006). As the GPI includes cost estimates of problem gambling and family breakdown caused by divorce and television viewing, it is clear that this measure is more value-laden than the ISEW. It might even be argued that the GPI is normative, as it claims to know what is best for people.

Measure of Domestic Product

In 2004, the new economics foundation (nef) published an updated ISEW variant for the UK (Jackson 2004). The index was again re-branded, this time as a Measure of Domestic Progress (MDP). One of the aims of this work was to underline the potential of alternative measures of economic welfare as a useful way of measuring a country's progress towards sustainable development. The various components of the MDP were therefore related explicitly to the different dimensions (or pillars) of sustainable development: the economy, society and the environment.

Index of Economic Well-Being

The Index of Economic Well-Being (IEWB) was developed by Osberg and Sharpe (1998) in an effort to address the fact that GDP per capita, the measure of aggregate economic well-being that is most widely used, is severely limited. The IEWB is based on 4 dimensions or components of economic well-being: consumption, accumulation of capital stocks (including natural capital stocks), income distribution and economic security. For each of these dimensions, a number of indicators are selected and combined into a single index (18 indicators are used in total). Several weighting schemes can be used to combine the indexes for the four individual dimensions into one single number. Osberg and Sharpe (2002) use two different sets of weights: a 'standard' weighting which assigns equal weight to each component and a 'consumption-oriented' alternative, which is much more heavily weighted to average consumption. The IEWB is the only measure of economic welfare that does not draw on a conceptualization of income to build its methodological framework. Furthermore, it does not use monetary valuation techniques to aggregate the different components into a single index. Many of the variables in the IEWB are also included in the ISEW and GPI, yet these measures give a much greater

weight to environmental variables because of the particular methodologies used to estimate the losses associated with these variables.

4.3 Measures of Sustainability

Figure 3 organizes a number of efforts to monitor sustainability and sustainable development according to the different approaches to sustainability presented in section 3.3.

Sustainable Development Indicators (SDIs)

A large number of sustainable development indicator (SDI) sets have been put forward over the last fifteen years. At the core of these sets lie conceptual frameworks that are vital to analyze the trends over time of the different dimensions of sustainable development. Most sets of SDIs focus on the three ‘pillars’ of sustainable development: economy, society and environment. Rather than aggregating the different SDIs into a single index, the SDIs are analyzed individually in order to get an overall idea of the progress made towards sustainable development. The best-known effort to develop a SDI set is the ongoing project at the United Nations Commission on Sustainable Development (UNCSD) that was initiated in 1996. The current set of SDIs includes 96 indicators that are grouped into 14 main themes. The UNCSD has also launched a set of 50 core indicators that cover issues that are relevant for sustainable development in most countries and for which data are either readily available or could be made available within reasonable time and costs. Many individual countries were involved in the process of compiling the UNCSD set of indicators. At the European level, Eurostat developed a set of SDIs to monitor progress towards the goal of reconciling economic development, social cohesion and the protection of the environment set out by the EU Sustainable Development Strategy. The framework developed by Eurostat groups 155 indicators into ten themes that reflect the key challenges of the strategy. The indicators are further organized into a three-story pyramid structure (overall objectives, operational objectives and actions).

Ecological Footprint

The ecological footprint was first proposed and developed by Wackernagel and Rees (1996). Its main objective is “to translate all the ecological impacts of human activity into the area required to produce the resources consumed and to assimilate the wastes generated under the predominant management and production practices in any given year” (Neumayer, 2004). The ecological footprint is a physical indicator of sustainability that is expressed in land units. It compares human consumption of natural resources with our planet’s ecological capacity to regenerate them and to absorb the related waste flows. At a national level, the ecological footprint is defined as the amount of biologically productive land area required to support the consumption of a given population. If a country’s ecological footprint is higher than its available land area, current consumption is not sustainable since the biological capacity of the land is exceeded. The economic activities, responsible for the ecological footprint, are thus unsustainable. Empirically, energy, food and timber consumption as well as carbon emissions are transformed in terms of land area needed to produce or absorb these flows. The sum is then compared

with the amount of available productive land area per capita. In the early 2000s, the Global Footprint Network was established to bring together individuals, nations, scientists, NGOs and academics in an effort to advance the impact of the Ecological Footprint measure in the world. Since 2002, WWF includes the indicator in its biennial Living Planet Report.

Environmental Sustainability Index

The Environmental Sustainability Index (ESI) is a composite index that aggregates a wide range of environmental indicators to measure a country's performance in sustaining a healthy, livable environment. It quantifies the likelihood that a country will be able to preserve valuable environmental resources effectively over a period of several decades. The ESI was compiled by Yale University's Center for Environmental Law and Policy in collaboration with Columbia University's Center for International Earth Science Information Network (CIESIN) and the World Economic Forum. Within the ESI-framework, environmental sustainability is defined along 5 dimensions: (healthy) environmental systems, reducing environmental stresses, reducing human vulnerability, social and institutional capacity, and global stewardship. The index keeps track of ecological sustainability through 21 equally weighted indicators, each of which is in turn made up of 2 to 12 data sets, for a total of 76 underlying data sets. Esty et al. (2005) can be consulted for a detailed description of the ESI methodology.

Genuine Savings

Sustainability can also be assessed by looking at how much a nation is saving for the future. National net savings are calculated as a part of the SNA as the total domestic savings minus the depreciation of human-made capital. The World Bank's Genuine Savings measure (S^*) - also referred to as Adjusted Net Savings (ANS) - adds a social and an environmental element to the national net savings. A nation's genuine savings rate is calculated as the gross domestic savings rate minus the human-made capital depreciation minus the depletion of natural resources minus pollution damages. A higher value of S^* (measured as a percentage of GDP) implies that a nation is saving more for the future. The genuine savings rate can also be negative, when rates of human-made capital depreciation or depletion of natural capital are high. In other words, a nation's positive investments in human-made capital can be offset by the depletion of its natural capital stock. The policy implications of measuring genuine savings are quite direct (Hamilton and Lutz, 1996): sustained negative genuine savings must lead, eventually, to declining human welfare. As changes in both the humanmade and the natural capital capital stock are summed in the methodology of the Genuine Savings measure, it classifies as a measure of weak sustainable income. The World Bank has estimated genuine savings rates for many countries by quantifying the effects of energy, mineral and forest depletion as well as the damage from carbon dioxides in monetary terms. Data are available from the World Development Indicators website⁸.

CRITINC

⁸ <http://devdata.worldbank.org/wdi2005/>

The CRITINC approach (Ekins et al., 2003) is a general natural capital accounting method developed to achieve ecological sustainability through the identification and protection of the critical natural capital elements in the ecosystem that is being assessed. First, the main characteristics and their related ecosystem services provided by the ecosystem under consideration are identified. Next, economic Input-Output accounts are incorporated to monitor the impacts of different economic activities on the ecosystem services. This assessment is then compared to sustainability standards set by experts (e.g. scientists or government representatives), expressed as either state or pressure indicators. A state indicator describes the minimum quantity of natural capital necessary for continued functioning, while a pressure indicator looks at the maximum pressure that a natural capital stock can tolerate and still maintain its functions. The difference between the actual and sustainable levels is referred to as the ‘sustainability gap’ (SGAP) and provides targets for policy. Evaluation of the costs to bring the SGAP to zero through abatement, avoidance or restoration of critical natural capital is also useful for policy design. Several empirical applications of the CRITINC methodology have been undertaken over the last five years (e.g. Ekins and Simon 2003).

5. Conclusions

In order to overcome the shortcomings of GDP, many alternative measures for policy-making have been developed over the years. Most efforts concentrate on the development and promotion of individual indicators, while paying less attention to the wide range of indicators already available and to theoretical insights. As a result, only two classification schemes exist today: an origin-based scheme used by the OECD and an objective-based scheme used by the European Parliament. While both schemes have their merits, they also have their drawbacks. The origin-based approach tends to oversimplify the current state-of-the-art in human wellbeing research, as it ignores the increasing level of interdisciplinarity in the research area. The objective-based approach on the other hand puts too much emphasis on GDP, while it is widely agreed upon that this indicator does a poor job in capturing either human well-being or economic welfare. More importantly, both classification schemes group indicators that aim to quantify fundamentally different concepts.

A new substance-based classification scheme is introduced in this paper. Measures are categorized by the underlying concepts that they aim to quantify: well-being, economic welfare and sustainability. Measures of well-being aim to comprehensively evaluate either a single person’s life situation or the life situation of a group of people. These measures are multi-dimensional by nature and can be linked to different theoretical conceptualizations of well-being. Measures of economic welfare capture the contribution of a nation’s economy to the overall level of well-being enjoyed by its citizens. They can thus be regarded as measures of the economic dimension of well-being. Measures of sustainability investigate whether the current levels of well-being and economic welfare can be sustained into the future. By focusing on the underlying concepts, the substance-based classification scheme overcomes the drawbacks of the existing schemes and can be used to comprehensively assess the progress of societies.

A further sub-categorization is developed according to the different approaches to quantitatively capture the notions of well-being, economic welfare and sustainability. Two criteria are used to categorize measures of well-being: the underlying conceptualization of well-being used by the measure (utilitarianism, human needs, capabilities) and the nature of the data used by the measure (objective data versus subjective data). Measures of economic welfare are primarily grouped according to the different income concepts that they use (economic income, sustainable income, psychic income). A second division is based on whether or not the different measures include adjustments for environmental issues. Sustainability measures are organized according to the different approaches to sustainability they employ (three-pillar approach, ecological approach and capital approach). Finally, a total of 23 alternative measures for policy-making were briefly presented and organized into the substance-based classification scheme.

In comparison to the Stiglitz-Sen-Fitoussi report, the newly developed classification scheme adds the notion of economic welfare to the “Beyond GDP” debate. It is important that not only new measures of well-being and sustainability are developed next to GDP, yet also, and even more importantly, that appropriate measures are used when evaluating the contribution of the economic system to the overall level of well-being. The criticisms on GDP as a measure of either well-being or sustainability are nowadays widely accepted, yet when assessing the economic dimension of well-being, GDP is still being used very often and this while the concept of economic income is not particularly suited to monitor economic welfare.

The main contribution of the new classification scheme is its focus on the different concepts that underlie the indicators and indices. As such, it indicates which measures should be seen as ‘competitors’ when composing a set of indicators to monitor societal progress, while indicators that focus on different concepts should be seen as ‘complements’. The scheme also outlines the different conceptualizations of the notions of well-being, economic welfare and sustainability and is hence useful in the debate on which approach or combination of approaches to choose. It is clear that any set of measures to monitor progress should include at least one indicator of each subcategory.

Finally, the substance-based development scheme helps to bridge the gap between measurement practice and theory, as it emphasizes the different underlying notions of the indices and the conceptualization used in their methodologies. As a result, the debate on which indicators to favor is redirected to discussing the appropriateness of the different theoretical conceptualizations. For instance, when picking a measure of economic welfare, the concept of economic income is less useful than the concepts of sustainable and psychic income. For the other types of alternative indicators, however, the choices are far more complicated.

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Figures

Figure 1 – Measures of Well-Being

	Utilitarianism	(Basic) Human Needs	Functionings and Capabilities
Objective Approaches	Gross Domestic Product Consumption Expenditures	Hierarchical Needs Fulfillment of Hierarchical Needs Index (Clarke 2005) Non-hierarchical Needs (Weighted) Index of Social Progress (Estes 1984; Estes 1997) Calvert-Henderson Quality-of-Life Indicators Sustainable Development Sustainable Society Index (Van de Kerk and Manuel 2008)	Human Development Index (UNDP) Physical Quality-of-Life Index (Morris 1979)
Subjective Approaches	Happiness / Life Satisfaction World Happiness Database Global Values Survey Eurobarometer	Human Needs Assessment (Max-Neef 1992)	
Combined Approaches	Happy Life Expectancy (Veenhoven 1996) Happy Planet Index (New Economics Foundation)		

Figure 2 – Measures of Economic Welfare

	Economic Income	Sustainable Income (Hicks 1939)	Psychic Income (Fisher 1906)
Non-Environmentally Adjusted Measures	Gross Domestic Product (GDP)	Net Domestic Product (NDP)	Measure of Economic Welfare (MEW) (Nordhaus and Tobin 1972)
Environmentally Adjusted Measures		Environmentally Adjusted Net Domestic Product (EDP) <i>(weak sustainability)</i> Sustainable National Income (SNI) (Huetting 1995) <i>(strong sustainability)</i>	Economic Aspects of Welfare (EAW) (Zolotas 1981) Index of Sustainable Economic Welfare (ISEW) (Daly and Cobb 1989) Genuine Progress Indicator (GPI) (Cobb et al. 1995b) Measure of Domestic Progress (MDP) (New Economics Foundation)
Non-Income	Index of Economic Well-Being (Centre for the Study of Living Standards)		

Figure 3 – Measures of Sustainability

Three-Pillar Approach	Ecological Approach	Capital Approach
Sustainable Development Indicators (a) UN Commission for Sustainable Development (b) Eurostat	Ecological Footprint (Wackernagel and Rees 1996) Environmental Sustainability Index (Universities of Columbia and Yale)	<i>Constant Capital Stocks</i> Genuine Savings (World Bank) <i>Critical Natural Capital</i> CRITINC (Keele University)