WELFARE MEASUREMENT IN A NATIONAL ACCOUNTING FRAMEWORK

Anna Kulig, Hans Kolfoort and Rutger Hoekstra

Summary: The objective of this paper is to propose a set of strategies which will enable Statistics Netherlands to produce indicators for sustainable welfare. All strategies are based on the National Accounts and its satellite accounts because they produce mutually consistent indicators. The paper starts off by providing the definitions of welfare, well-being and sustainability. The paper then provides an extensive literature review of the different approaches and methods. Furthermore, the strategies adopted by other countries and international organisations are summarized. Finally, this paper proposes three strategies which may be adopted by Statistics Netherlands to produce a set of indicators for sustainable welfare.

Keywords: GS, MEW, ISEW, GPI, SNBI, HDI, Sen’s capability approach, SNI, ISS, critique GDP, indicator sets, sustainable development, capital approach, national wealth, welfare, well-being, happiness, GDP, NI, GNI, economic growth, SAM, NAMEA, SESAME, DPSIR, composite indicators
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1. Introduction

One of the main products of statistical institutes is the National Accounts (NA), which represents the official statistical overview of the national economy. They provide the framework for preparing, discussing and evaluating economic and monetary policy. The system is based on international agreements about definitions, measurement and classifications, which are documented in the ‘System of National Accounts’ (SNA) (United Nations, 1993) and related handbooks such as the ‘European System of Accounts’ (ESA) (Eurostat, 1996).

The NA system yields macro-economic aggregates, of which GDP is well-known and widely used. However, GDP is controversial, particularly because it has a long history of being used as an indicator for (social) welfare. This practice has been criticized, correctly according to Statistics Netherlands\(^1\), for many decades (see for example van den Bergh, 2006). The SNA (section 2.178) mentions that ‘neither gross nor net domestic product is a measure of welfare. Domestic product is an indicator of overall production activity’.

The SNA distinguishes a core system but also leaves open the possibility of tailor-made satellite accounts which contain additional information in areas for which the core system is inadequate. These satellite accounts sometimes introduce additional classifications or definitions, but indicators remain consistent with the core system. The satellite accounts for the environment are probably best known (SEEA, 2003; Milieurekeningen, 2006).

Although satellite accounting is increasingly adopted, it has not yet been applied to broad topics such as “welfare”, “sustainability” or “well-being” which play an important role in many policy debates, scientific publications and social discussions. For that reason it is useful for Statistics Netherlands to explore a conceptual framework, based on satellite accounting, which produces a set of indicators for the above mentioned topics.

This paper provides an overview of the relevant scientific and policy literature, as well as practices in other countries and international organizations. The paper identifies three strategies which may be followed by Statistics Netherlands to come to a set of indicators based on satellite accounts.

This paper is structured as follows. Section 2 provides an overview of the relevant literature: definitions of the core concepts (2.1), criticisms of the use of GDP as a welfare indicator (2.2), summary of work on measuring of welfare done by Statistics Netherlands (2.3), the international context (2.4), overview of indicator approaches and methods (2.5) and work in other countries (2.6). Section 3 proposes three strate-

\(^1\) The annual publication of the National accounts includes a comment to users not to use GDP as a measure of social welfare (Statistics Netherlands, 2006).
gies which may be adopted by Statistics Netherlands. Conclusions are drawn in section 4.

2. General background

The concepts of welfare, well-being and sustainable development which underlie this report are not well-defined. It is beyond the scope of this paper to bring clarity to the abundant literature on these issues. Nevertheless, in this section we will provide a brief definition of these terms.

2.1 Definitions of some core terms

2.1.1 Welfare

Welfare refers to disposal of goods and services (Veenhoven and Timmermans, 1998) or to the satisfaction of needs by means of scarce goods and services (Marijs and Hulleman, 1998).

2.1.2 Well-being

Well-being generally refers to an individual being well, happy or prosperous (Van de Ven et al., 2000). Well-being also refers to the state in which a person is prosperous and happy both in a material and in a mental way. Well-being alludes to the extent of perception of happiness by people in a society (Marijs and Hulleman, 1998).

2.1.3 Sustainable development and sustainability

The well-known ‘Brundtland-Commission’ defines ‘sustainable development’ as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission Report, 1987). It comprises an economic, an environmental and a social dimension.

Sustainability is defined as the capacity to provide non-declining future welfare (Neumayer, 1999). It is often operationalized by defining different forms of capital such as man-made capital, human capital, natural capital and social capital (Figge and Hahn, 2004). Often a distinction is made between weak and strong sustainability. Weak sustainability assumes that the total capital stock is non-declining. So, weak sustainability allows substitution of a natural capital, man-made, human and social capital. Strong sustainability assumes that each different type of capital is non-declining.

In SEEA (2003) weak sustainability is defined as follows: Weak sustainability seeks to maintain from year-to-year the per capita income generated from the total capital stock available to a nation (measured in monetary terms). No regard is given to the composition of this stock, as it is assumed that all forms of capital are substitutes for one another. Weak sustainability clearly allows for the depletion or degradation of natural resources, so long as such depletion is offset by increases in the stocks of other forms of capital (for example, by investing royalties from depleting mineral reserves in factories).
non-declining.\textsuperscript{3} If one of the capital stocks declines it can therefore not be compensated by an increase in another.

\textbf{2.1.4 GDP and other national accounting aggregates}

Gross Domestic Product (GDP) is a measure of overall production activity. It can be measured in three ways. It is defined as total value added of all industries plus the balance of taxes and subsidies on products plus the difference between imputed and paid VAT. This is the so called \textit{production approach} of GDP. In addition to this approach the \textit{expenditure approach} exists, in which domestic production of goods and services, intended for consumption, capital formation and export is represented. Finally, GDP also is equal to the income from the domestic production process. This is the \textit{income approach}.

The volume growth of GDP is usually referred to as \textit{economic growth}.

In current prices Gross National Income (GNI) equals GDP plus net primary income from the rest of the world. GNI minus depreciations is Net National Income and is usually referred to as \textit{National Income}.

\textbf{2.2 Critique with respect to GDP}\textsuperscript{4}

In the past many economists have used GDP for the measurement of welfare. However, GDP (or related concepts such as GNP and NI) are good indicators for production, income, economic growth but not appropriate as a welfare measure. Moreover, GDP was never meant to measure welfare, because the concept of welfare is far broader than economic production only. GDP, for example, does not account for social and ecological costs. Besides, contributions of e.g. household and volunteer work to welfare are not taken into account in GDP.

In this section the main arguments against GDP as a welfare indicator are summarized:

1. The first one refers to lexicographic preferences which are defined by two characteristics:

\begin{itemize}
  \item people have limited needs with respect to certain services and goods at a certain consumption level;
  \item ‘lower’ needs (e.g. the removal of hunger) have to be fulfilled before ‘higher’ needs (e.g. recreation) can appear.
\end{itemize}

\textsuperscript{3} SEEA (2003) defines strong sustainability in the following manner: \textit{Strong sustainability} requires that all forms of capital be maintained intact independent of one another. The assumption implicit in this interpretation is that different forms of capital are mainly complementary; that is, all forms are generally necessary for any form to be of value. Produced capital used in harvesting and processing timber, for example, is of no value in the absence of stocks of timber to harvest. Only by maintaining both natural and produced capital stocks intact, the proponents of strong sustainability argue, can non-declining income be assured.

\textsuperscript{4} This section has been mainly based on the article of Jeroen van den Bergh ‘Abolishing GDP’, 2006.
Within this framework income growth and associated growth of material consumption (e.g. in polluted environments) is thus an imperfect compensation for a lack of satisfaction of basic needs such as clean water. Individual and social welfare can remain constant or even decline while GDP and the individual income increase.

II. The second argument against GDP concerns subjective welfare and happiness. Subjective well-being studies also show that, at the individual level, welfare does not depend only on income (there is no perfect correlation between income and welfare) (Easterlin, 2001; Frey and Stutzer, 2002; van Praag and Ferrer-i-Carbonell, 2004; Ferrer-i-Carbonell, 2005). Other income-independent factors such as having a partner (and stable family), being healthy or having friends, influence individual welfare or happiness.

Hence, if income does not exhibit a reliable and robust relationship to happiness at the micro-level, then it is extremely unlikely that the aggregation of individual incomes in a GDP provides a good indicator of social welfare at the national level.

III. The third argument concerns income distribution, relative welfare and rivalry. The GDP per capita indicator stresses average income. An unequal distribution implies unequal opportunities for personal development and well-being. However, GDP per capita does not distinguish between the expenditures of the poor on basic goods and of the rich on luxury goods. Another related aspect of distribution is that individual welfare cannot be separated from the welfare of other individuals in the relevant social environment (‘peer group’). Therefore, the term ‘relative welfare’ or ‘context dependent preferences’ is used (Tversky and Simonson, 2000). Such preferences are characterized by an urge to compare oneself with others and rivalry. Subjective well-being research has shown that poverty often means that individuals are unhappy because they can consume much less than the majority of individuals in their social environment. Consumption surely is not only driven by needs in general but also by imitation and search for status.

IV. This argument against GDP regards formal versus informal economy. In general, GDP covers only activities and transactions that have a market price and completely neglects informal transactions between people that occur outside formal markets (such as voluntary work, household work, and child care). The fact that the informal economy is left out of consideration explains why GDP per capita for many countries can be extremely low. At the same time, it can easily give a wrong picture of how happy people really are. GDP cannot serve as a measure to judge the welfare impact of fundamental changes that involve transitions of the informal to the formal economy. The expansion of markets to include informal activities is not always good for social welfare, even if GDP is raised.

V. The next argument concerns the principles of proper accounting. The use and calculation of the GDP indicator is inconsistent with some of the principles of
good bookkeeping. For instance no clear division between costs and benefits is made. In order to make it more clearly a simple example will be given. Increase of the number of traffic accidents can be seen by the majority as a decrease in welfare. In spite of this the GDP will be still growing because of the increase in the production of the ambulance services.

VI. Macroeconomics, and in particular economic growth theory, is concerned with the dynamic aspects of the economy as a whole and it does not offer any support for the idea that GDP can serve as a measure of social welfare. This is consistent with the most recent ‘System of National Accounts’ (United Nations, 1993) where in paragraph 2.178 is written ‘Neither gross nor net domestic product is a measure of welfare. Domestic product is an indicator of overall production activity.’

VII. A general shortcoming of GDP as an indicator of social welfare has to do with its aggregated character where the production activities that have negative effects on the welfare still lead to the growth of the GDP. For example industry that provides a lot of pollution make people sick what leads to a decrease in perceived welfare. Nevertheless, both the production coming from this industry as well as medical help are added as positive activities to the GDP.

VIII. Furthermore, another important argument against GDP as a welfare indicator concerns the fact that there is no deduction made with respect to the harmful external effects on environment that were caused by production of goods and services. The defensive costs are counted as positive. These costs include expenditures on the environmental protection and on treating damage from a polluted environment created by economic activities (SEEA, 2003). Thus, if air, water or natural areas are being polluted, any damage does not enter GDP, but when pollution is being cleaned this increases GDP (United Nations, 1993).

IX. The last argument relates to the natural environment and resources. This involves goods and services delivered by nature. The (capital) depreciation associated with environmental changes (fish stocks, forests, biodiversity) and depletion of resource supplies (fossil energy, metal ores) is missing from the GDP calculation. However a correct economic welfare approach would only characterize changes as real progress (welfare improvement) if they are accompanied by a sustainable use of environment and nature what was already recognised by Hueting (1974).

2.3 Summary of relevant work by Statistics Netherlands

Policy makers, economists and others often use GDP as an indicator of the welfare of a society. However, welfare and the broader term well-being depend on more aspects than economic performance alone and therefore benefits from a multidimensional approach. The SNA not only provides a systematic overview of economic performance but also of social, environmental and other factors. Satellite accounts...
play an important role in this. This chapter provides an overview of the work on the measurement of welfare and well-being which has been undertaken at Department of National Accounts of Statistics Netherlands.

2.3.1 Social Accounting Matrix (SAM)

A Social Accounting Matrix (SAM) includes information on the relation between persons, households and the economy (Timmerman and Van de Ven, 1994). For the compilation of the SAM, three statistical systems have been used: the national accounts, the labour accounts and the socio-economic accounts and they have been combined in such a way that the resulting system is consistent with the national accounts figures (National accounts of the Netherlands 2005, 2006). A SAM is very relevant for the measurement of welfare as it contains detailed information on employment, distribution of income and expenditure of income presented by household and employment categories (van de Steeg et al., 2006).

In the SAM, labour input and compensation of employees have been subdivided by gender and seven levels of education. Furthermore, income generated by production of goods and services, other payments and receipts of income, consumption expenditure and saving are described for fifteen household groups. In the Dutch case, the grouping of households has been based on main source of income (wages and salaries, entrepreneurial income, or transfer income), and composition of the household (single-person households, and multi-person households with/without children). As a consequence, the labour market and aspects of income distribution can be directly related to the economic process. In the near future, other or more detailed breakdowns will become available.

Some distinguishing features of a SAM are:

- its incorporation of both the supply and demand side of actual labour markets (on which persons and not households operate);
- its emphasis on the interrelations between economic processes (so that both ends of all transactions are shown), which makes it quite expedient for economy-wide modelling and analyses.

Although a SAM provides a useful insight into the functioning of an economy, it is still incomplete as a framework for a comprehensive analysis of welfare because a SAM is fully expressed in monetary units, whereas (changes in) attributes of well-being are typically measured as (changes in) non-monetary units (van de Ven et al. 2000).

The SAM contains a large amount of detailed socio-economic information, in which it offers a much better understanding of the interrelations between the transactions of a large number of household groups, product groups, industries and the like (Statistics Netherlands, 2006).
2.3.2 National Accounting Matrix including Environmental Accounts (NAMEA)\(^5\)

In the Netherlands the central framework of the National Accounts has been extended with environmental accounts, which is updated annually. The Dutch environmental accounts are compiled according to the definitions of the national accounts and the guidelines of the international System of Integrated Environmental and Economic Accounting (SEEA, 2003). Accordingly, the data from the environmental accounts are internationally comparable. The systematic presentation of information on the environment and economy facilitates an objective analysis of economic and environmental policy issues. The sustainability of well-being and its progress are closely linked to the environment.

Not only pollution caused by producers and consumers is shown, but also the entry of polluting substances in the Dutch environment: the domestically emitted pollution including the balance of cross-border pollution from and to the rest of the world. Cross-border pollution exists of two different parts:

- pollution by non-residents in the Netherlands or by residents abroad;
- supply and removal of pollution by surface water or air.

Because of the differences in concepts, the data of the environmental accounts can differ from other environmental and energy statistics.

At present, a wide variety of different environmental accounts are produced by Statistics Netherlands. The air emissions accounts cover environmental information on climate change (emission of greenhouse gasses), ozone layer depletion, acidification, and local air pollution. In the energy accounts the supply and use of energy products is shown both in physical and monetary terms. The waste accounts record the production of 70 different kinds of solid waste and how these are treated. The water accounts (NAMWA, national accounting matrix including water accounts) include both the production and consumption of water (tap water, groundwater, surface water), as the emission of hazardous substances to water (heavy metals, nutrients, pesticides etc.). The Dutch environmental accounts also include some monetary accounts related to environmental subjects, namely the environmental expenditure accounts and the environmental tax accounts. Finally, monetary and physical accounts are combined in the NAMEA-matrix (National accounting matrix including environmental accounts).

The range of Dutch environmental accounts will be expanded in the next few years. New work will be undertaken with regard to material flow accounts (MFA), subsoil accounts for oil and gas reserves, and integrated asset accounts for land in physical and monetary units. Also the monetary accounts will be extended with respect to environmental subsidies and the environmental goods and services sector. Finally, the data from the environmental accounts will be used to do some detailed environ-

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\(^5\) We would like to thank Sjoerd Schenau (Statistics Netherlands, sector National Accounts) for his helpful comments on this section.
mental-economic analyses (structural decomposition analysis, impact analysis, IO-analysis, etc.).

2.3.3 System of Economic and Social Accounting Matrices including Extensions (SESAME)

The SESAME approach can be defined as a detailed and integrated statistical information system in matrix format from which a set of core (macro-) indicators for different aspects of welfare and well-being can be derived (Keuning, 1997). Such a summary typically describes trends in main indicators: e.g. Gross Domestic Product (GDP), population size, (un)employment, inflation, income inequality, environmental indicator(s), unpaid household and volunteer activities, average income in the poorest subgroup, average number of years of schooling, average expenses on health, average number of victims from crime (van de Ven et al. 2000).

In essence, SESAME meets the concern already expressed in a 1977 United Nations’ report: “It is recognised by all that it is not practicable to make a direct measure of the welfare of a community in monetary or in any other terms. The best that can be done is to measure a number of factors that are generally supposed to contribute to or detract from welfare, not forgetting that the distribution of the aggregate among individuals may be as important from the welfare point of view as the aggregate itself.”

The central framework extended with the NAMEA and SAM form the foundation of the SESAME (Kazemier et al, 1999; Van de Ven et al, 2000; De Haan et al., 2002).

2.4 International context

2.4.1 Working Group on Sustainable Development Indicators (Eurostat)

The main goal of Eurostat Working Group on Sustainable Development Indicators is to establish an indicator list consistent with the Sustainable Development Strategy adopted by the Gothenburg European Council in June in 2001 and to gather the data from all Member States. The European Commission agreed to a set of sustainable development indicators in February 2005. By the end of 2007 a new report will be published, together with the reviewed list of indicators. The aim is to reduce the total number of indicators to 120 as compared with 155 indicators from 2005.

The monitoring report is preliminary aimed at providing a first progress report on the current state of play in the implementation of the strategy. It also describes the set of indicators for monitoring the implementation of the strategy. The trends derived from the analysis of indicators are assessed against policy objectives to inform general public and decision-makers about achievements, trade-offs and failures in attainment the commonly agreed objectives of sustainable development.
The SDI set is organised as a three-level pyramid:

- Headline indicators monitoring the ‘overall objectives’ of the SDS are at the top of the pyramid. They are characterized by robustness and availability with reasonably long time series (at least 5 years).
- The second level of the pyramid consists of indicators related to the operational objectives of the SDS.
- The third level consists of indicators related to the actions explicitly mentioned in the SDS or to other issues that are necessary to analyse progress towards objectives. Also breakdowns of level 1 and 2 indicators are present at level 3.

The set of SDI’s indicators consisted up to now of 12 headline, 45 core policy and 98 analytical indicators. SDI set forms a basis for regular monitoring of progress in the headline objectives of the SDS. A majority of the level 1 and 2 indicators (86%) address more than one dimension and 33% can be considered as three dimensional, addressing economic, social and environmental aspects simultaneously. The main weakness concerns the lack of indicators measuring both environmental and social dimensions. With respect to the general structure the indicators are divided into 10 themes and further into sub themes.

2.4.2 Working Group on Statistics for Sustainable Development (WGSSD) (UN-ECE/OECD/Eurostat)

The WGSSD is a joint working group which was initiated by the UN-ECE, OECD and Eurostat. Its aim is to “articulate a broad conceptual framework for sustainable development”. It has explicitly been asked to investigate the possibilities and limits of the “capital framework” as a conceptual system for statistics for sustainable development.

The WGSSD is split into 2 sub-groups. The first group will investigate the conceptual aspects of the capital approach in general. However, this group will also tackle complex issues such as human and social capital, for which concepts are less well defined as economic and natural capital. The second group will try to link the set of indicators which are produced by policy cycles (such as the WGSDI) to the capital framework.

The WGSSD will present its final report around June 2008.

2.5 Overview of indicator approaches and methods

2.5.1 Overview

In table 1 the various approaches and methods used to produce indicators (sets) for welfare are divided into two main parts: composite indicators and sets of indicators. In the former approach a single indicator is used as an indication of welfare (for description see section 2.5.2). Six of these approaches can be considered as methods
that provide corrections of the National accounts aggregates. Besides, the description of three other approaches is given.

**Table 1. An overview of approaches**

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<th>Composite indicators</th>
<th>Corrections of National Accounts aggregates</th>
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<td>Monetary Capital Approach (Genuine Savings)</td>
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<td></td>
<td>Measure of Economic Welfare (MEW)</td>
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<td>Index of Sustainable Economic Welfare (ISEW)</td>
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<td>Genuine Progress Indicator (GPI)</td>
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<td>Sustainable Net Benefit Index (SNEI)</td>
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<td>Sen’s Capability Approach</td>
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<td>Index for a Sustainable Society (ISS)</td>
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The ‘sets of indicators’ approaches on the other hand (for description see section 2.5.3) are based on the idea that one figure for sustainable welfare is not satisfying because welfare is a multidimensional and complicated phenomenon, which needs a set of indicators to describe its different dimensions. We distinguish policy-based approaches and model-based approaches. The last mentioned approaches are divided in three frequently used models: based on classical dimensions of sustainability, the so called DPSIR-method and the (hybrid) capital approach.

### 2.5.2 Composite indicators

One approach to measure welfare is the so called composite indicator approach (also referred to as one-number approach indicators). These indicators combine information about a number of aspects in order to provide a single (usually monetary) measure of progress. Due to the rising criticism of the use of GDP as a welfare indicator, many of these indicators were developed in order to correct GDP in some way. In this subsection a brief outline of six modifications of the GDP (or other aggregates from the national accounts) will be provided. Additionally we will provide short descriptions of three other indicators that are discussed regularly in the literature.

#### a. Monetary Capital Approach (Genuine Savings)

The ‘Genuine Savings’ (GS) has been developed and used by the World Bank as a central indicator of sustainability. The World Bank states that “policies leading to the persistently negative genuine saving are unsustainable” (The World Bank, 2006).

The GS indicator is derived from modifications to the measure of savings in the existing accounts. In addition to making allowance for the depletion of energy, minerals and forests and for environmental damage caused by carbon dioxide emissions,
an adjustment is also made for education expenditure, which is taken to be an important contributor to increases in human capital (SEEA, 2003).

It is noteworthy that the GS indicator incorporates several environmental aspects. However, the value of depletion of natural resources and the costs associated with pollution damage are very difficult to estimate.

The ‘Genuine Savings’ indicator corresponds to the weak sustainability concept as it allows for substitution of natural resources by produced and human capital (Hartwick, 1977). Losses of natural capital are not regarded as problematic as long as they are compensated by economic and human capital. Thus a positive value of genuine savings approach does not always imply environmental sustainability.

b. Measure of Economic Welfare (MEW)

The MEW constitutes the first version of modified National Income and was constructed by Nordhaus and Tobin (1973) in order to reflect economic welfare more completely. Three kinds of modifications were introduced. First of all, expenditures with regard to health care and education were treated as investment in human capital whereas expenditures on police and on defence were treated as ‘intermediate’ thus not in themselves generating welfare (Lintott, 1996). Second of all, items with regard to the services of capital goods such as durable consumer goods or leisure time were added. Finally, costs of urbanisation were subtracted.

The SNA defined MEW as an adjusted measure of total national output, including only the consumption and investment items that contribute directly to economic well-being, calculated as additions to gross national product (GNP), including the value of leisure and the underground economy, and deductions such as environmental damage.

c. Index of Sustainable Economic Welfare (ISEW)

Daly and Cobb developed (Daly and Cobb, 1989) the Index of Sustainable Economic Welfare (ISEW) in order to provide a more reliable monetary indicator of economic welfare and sustainability (Neumayer, 1999). The ISEW was supposed to provide a remedy for a couple of aspects neglected by the GDP. This was accomplished by adding to GDP services that it omits, while deducting GDP categories that do not directly provide services to consumers. Moreover the ISEW was meant to replace/adjust the MEW because the latter did not include environmental concerns with regard to sustainability. Therefore depletion of natural capital and pollution were taken into account and this required valuing non-renewable capital. Daly conceptualised this valuation as “the amount of rent from resource production that should be reinvested in a process that would create a perpetual stream of output or a renewable substitute” (Cobb, J, 1998).
Additionally, the ISEW comprises corrections neutralizing income inequality and the unsustainability of production and consumption. In particular, the ISEW adapts:

- GDP for non-market goods and services;
- defensive costs of social and environmental protection and repair (health expenditure, costs of road accidents, costs of urbanization);
- reduction of future welfare caused by present production and consumption (loss of natural areas, loss of soil, depletion of non-renewable resources, air and water pollution, greenhouse effect);
- the costs of efforts to obtain the present welfare level (commuting, advertising, duration and intensity of work);
- the distribution of income and labour (inequality among workers, between employed and unemployed, between males and females).

The ISEW has become a measure of economic welfare and sustainable development (van den Bergh, 2006). It begins, like the MEW, with personal consumption, which assumes that the more individuals consume, the better their economic welfare. This could imply a high correlation between consumption and welfare. However, the results of Cobb’s and Daly’s study showed that whereas the GDP followed a rising trend, the ISEW showed a constant or even decreasing pattern after a certain time (Cobb, J. 1998).

Although the ISEW includes the costs of environmental damage and natural capital depletion and constitutes a measure of economic welfare, it does not imply a measure of the sustainability of the economic welfare (Bleys, 2006). Furthermore the ISEW is criticized for the high amount of subjectivity with regard to the assumptions made by the researcher during the incorporation of the items in the index. The assumptions concerning the weighting of income distribution, the valuing of the depletion of non-renewable resources and long-term environmental damage are rather arbitrary and if they are not clearly communicated, high risk of misinterpretation is present (Bleys, 2006; Neumayer, 1999). The ISEW corrects many aspects of GDP but restricts itself to economic aspects (van de Kerk, 2006). Neither GDP nor the ISEW give a complete picture of the society because they do not include social indicators such as subjective well-being measures or social summary index (Bleys, 2006).

d. Genuine Progress Indicator (GPI)

The GPI deviates slightly from the ISEW in terms of the specific categories of corrections included.

Firstly, GPI includes the following monetary benefits that were ignored by the GDP: volunteer work and the value of time spent on household work, parenting, the value of services of consumer durables (e.g. cars) and the services of highways and streets. Secondly the GPI deducts three important categories of expenses that detract from the nation’s well-being: defensive expenditures, defined as money spent to maintain the household’s level of comfort, security, or satisfaction, further social costs, such
as the cost of divorce, crime or loss of leisure time and finally depreciation of environmental assets and natural resources.

Both ISEW and the GPI suggest that the costs of economic growth now outweigh the benefits, leading to “growth that is uneconomic” (paraphrasing Herman Daly in van den Bergh, 2006).

e. Sustainable Net Benefit Index (SNBI)

In the critiques on the use of GDP as an indicator for welfare one of the arguments is that in calculating GDP poor bookkeeping is exhibited because no distinction is made between costs and benefit. This is the first aspect which is tackled in the construction of the SNBI. Two separate accounts are produced, one for ‘uncancelled’ benefits of economic activity and one for the ‘uncancelled’ costs of economic activity (Lawn and Sanders, 1999). Examples of these benefits are services yielded by museums and libraries, services from volunteer work; examples of these costs are noise pollution, resource exhaustion and biodiversity loss. The SNBI is defined as the difference between the two variables.

f. The Human Development Index (HDI)

The Human Development Index (HDI) was developed in 1990 by the United Nations (Matthews, 2006). The three main dimensions of HDI are aggregated via an unweighted average. Those three dimensions capture relevant aspects of human well-being:

- Longevity- measured by life expectancy at birth as a proxy for health achievement
- Knowledge- measured by adult literacy rate combined with gross educational enrolment ratio (for primary, secondary, and tertiary schools) as a proxy for educational attainment
- Standard of living- measured by GDP per capita in purchasing power parity U.S. dollars

Although the HDI was developed to measure empowerment and not welfare, United Nations implicitly assumed that enlarging people’s choices will enhance people’s (future) well-being, however an important addition is that human beings should not merely be looked upon as beneficiaries, but also as agents of chance in the development process (van de Ven et al., 2000).

The HDI has been criticised from the start. Firstly, the lack of measures of freedom and/or human rights was noted. Also quality of data and data availability as well as changes in distribution of income appeared to be a cause for concern. Moreover the three basic indices are added together to form the HDI, thereby making health, education and income equal substitutes. Finally, HDI does not cover the (environmental) capital. Consistent with Desai (1995) and Neumayer (2001) resource exploitation and the environmental degradation should be taken into account when devel-
oping the HDI because it would enable to check whether a country is ‘mortgaging the choices for future generations’.

g. Sen’s Capability Approach
Amartya Sen developed a conceptual framework that deals with human capability and freedom. He considers the development of a country as the expansion of people’s capabilities. Sen argues that neither opulence (income, commodity command) nor utility (happiness, desire fulfilment) constitute or adequately represent human well-being and deprivation.

Sen’s Capability Approach (Sen, 2007) evaluates social states in terms of human well-being in which the emphasis is on so-called functional capabilities. The Capability Approach has been very influential in development policy and in social sciences. One of the most important advantages is its flexibility, because Sen does not subscribe it to a fixed list of capabilities. This allows researchers to apply it in different ways. However, this could also be a disadvantage: how to operationalize the framework, what are valuable and important capabilities? Clark (2005) mentioned that Nussbaum (2000), for instance, has tried to complete the approach by answering this question. But other disadvantages remain, e.g. the usefulness of the approach for making inter-personal comparisons of well-being in the presence of potential disagreements about the valuation of capabilities including the relative weights to be assigned to these capabilities (Clark, 2005).

This approach contrasts with a common view that sees development purely in terms of GNP growth, and poverty purely as income-deprivation.

h. Sustainable National Income (SNI)
Sustainable National Income (SNI) has been developed by Roefie Hueting (1974 and 2007). SNI in the year of calculation is defined as the maximum attainable level of production whereby, with available technology in the year of calculation, vital environmental functions remain available for years to come. This is contrary to the ‘formal’ national income in which the loss of environmental functions is not taken into account. Environmental functions are defined as the possible uses of our non-human made physical surroundings, on which humanity is entirely dependent in its entire doings, whether they be producing, consuming, breathing or recreating.

Evaluating the development of a country attention is paid to the distance between ‘formal’ national income and SNI. Due to the fact that the SNI is by definition lower than the ‘formal’ national income, an increasing distance implies more sustainability.

In pointing to the advantages and disadvantages of the SNI, van den Bergh (2006) has formulated it as follows: SNI has the advantage of taking into account general equilibrium effects of corrections but the disadvantage of restricting itself to environmental and natural resource issues.
i. Index for a Sustainable Society (ISS)

The ISS is an index which is based on 5 categories: Personal Development, Clean Environment, Well-balanced Society, Sustainable Use of Resources and Sustainable World. It integrates the most important aspects of quality of life and sustainability in an understandable way.

The five categories contain 22 indicators in total. The values of these indicators are between 0 (no sustainability or quality of life) and 100 (perfect sustainability or quality of life). The indicators have been calculated with specific mathematical formulas, after which with weights for each indicator the categories are calculated (values between 0 and 10). Finally, weights for the categories are assessed to reach the ISS (Netherlands number 12 with value 6.2, Norway first with 7.0).

The first report about ISS (every two years a new report will be published) provides data for 150 countries.

In the ISS economic factors do not play an important role. The way of determining the weights of the indicators and the categories also constitutes a disadvantage as it is a rather arbitrary.

j. Summary of composite indicators

In this section we have provided a summary of the alternatives of GDP. However, none of these measures has been fully accepted as measure of welfare in the literature or in practice. The reason is that no consensus exists about which aspects should and should not be included in a ‘composite indicator approach’. For instance, regarding the ISEW, Stockhammer et al. (1997) argued that the most important critique is that welfare is a multidimensional phenomenon and cannot be reduced to one dimension. In our view this applies for all alternatives regarding the GDP. Lawn (2003) emphasizes that ISEW and GPI require more robust monetary valuation in order to arrive at acceptable indicators.

In the case of indicators such as the HDI and ISS different aspects possess different measuring units and any choice of weights is rather subjective and should, in our view, be made by politicians, not by statisticians.

Table 2 shows which aspects are covered by the composite indicators (excluding Sen’s Capability Approach as it deviates too much from the others). In this table several aspects described in this section have been listed in the first column (categorised by four groups) in order to get a comparison between the composite indicators.
In section 2.2 the critique with respect to GDP as a welfare indicator are discussed. In order to check whether these arguments against GDP as a welfare indicator are covered by the existing alternatives (composite indicators) we have drawn up the table below (table 3).

Table 3. Arguments against the GDP versus composite indicator approach

<table>
<thead>
<tr>
<th>Arguments against the GDP / Composite indicator approach</th>
<th>HDI</th>
<th>GS MEV</th>
<th>SIEV</th>
<th>GPI</th>
<th>SNBI</th>
<th>SEN'S CA</th>
<th>SNI</th>
<th>ISS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Leisure time</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II Individual happiness and social welfare</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III Income distribution, relative welfare and rivalry</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV Formal economy</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V Principles of proper accounting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI Concept of GDP</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII Defensive costs and environmental externalities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>VIII Deposition of natural resources</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 3 shows that three out of the nine points of criticism with respect to GDP are not covered by any of the indicators included in the table. Moreover the HDI indicator covers none of the arguments against the GDP.

2.5.3 Indicator sets

As opposed to composite indicators many countries and institutes have adopted indicator sets to monitor sustainable development or welfare. A number of countries base their indicator sets on their policy statements (policy-based approach). Other countries use a conceptual model (the model based approach). Examples include the dimensions of sustainability, the capital approach and the DPSIR-model.

---

6 This section has been largely based on the working paper of Julie Hass and Thorvald Moe “Challenges in establishing sustainable development indicators”, Oslo 2006
In the tables below we have provided a short description of each approach as well as advantages and disadvantages of each method.

a. Policy-based approaches

In the policy-based approach indicators are selected on the basis of government policy on sustainability. Table 4 summarizes the characteristics, strengths and weaknesses of the policy-based approach.

Table 4. Policy-based approach

<table>
<thead>
<tr>
<th>Policy-based approach</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding meanings of the policy statements</td>
<td>High correspondence between the indicators and the policy relevancy</td>
<td>Problems with interpretation of political documents</td>
</tr>
<tr>
<td>Establishment of the SD definition</td>
<td>Indicators can be created for multinational or geographic regions for which there is a policy document</td>
<td>Possibility that the political statements will not provide a comprehensive or theoretically robust definition of SD thus risk that incomplete or non-robust definition of SD will be used</td>
</tr>
<tr>
<td>Identification of different policy topics and themes</td>
<td>Political statements and policies can and most likely will change over time what can but not necessarily will lead to a change in the definition of SD and the corresponding indicators</td>
<td>The instability of the indicators set can lead to problems when trying to track long-term trends since establishing the data required for the indicators can be costly and take time to establish</td>
</tr>
</tbody>
</table>

b. Model-based approaches: the dimensions of sustainability

The first type of model-based approach is based on the three dimensions defined by the Brundtland report. The characteristics, strengths and weaknesses of this approach are shown in table 5.
Table 5. Model-based approaches: the dimensions of sustainability

<table>
<thead>
<tr>
<th>Model-based approach</th>
<th>Economic dimension</th>
<th>Environmental dimension</th>
<th>Social dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td><strong>Weaknesses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD is defined by the model</td>
<td>The risk that the indicator will be less politically relevant and will not be used in connection with implementing any policies regarding SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is to be included and excluded is determined by the definitions of the model</td>
<td>In the quest to quantify SD through the use of the indicators certain assumptions are made when the indicators and related calculations are defined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The model is theoretically robust and is characterised by a long-term perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Model-based approaches: the hybrid capital approach

The hybrid capital approach is basically the same as the monetary capital approach described in section 2.5.1 except that not all the forms of capital are monetarised. Table 1 shows the difference components of national wealth, while the strengths and weaknesses of the monetary capital approach are summarized in table 7.

Table 6. Model-based approaches: the hybrid capital model

<table>
<thead>
<tr>
<th>Components of National Wealth</th>
<th>Economic Capital</th>
<th>Natural Capital</th>
<th>Human Capital</th>
<th>Social Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Capital</td>
<td>Produced (Real) Capital</td>
<td>Natural Resources</td>
<td>Land and surface water</td>
<td>Eco-systems</td>
</tr>
<tr>
<td>money, shares</td>
<td>machines, buildings</td>
<td>fossil fuels, coal, oil and gas</td>
<td>hydro- and wind power</td>
<td>nature's absorptive capacity for waste products</td>
</tr>
<tr>
<td>urban land</td>
<td>minerals, sand and gravel</td>
<td>biodiversit, fish, birds</td>
<td>labour, know how, level of education</td>
<td>the value of institutions, social organisations and networks</td>
</tr>
<tr>
<td>soil</td>
<td></td>
<td>forested land</td>
<td>competences, skills, experience</td>
<td>state of governance (freedom, choice)</td>
</tr>
<tr>
<td>monetary assessment (NA)</td>
<td>monetary assessment (NA)</td>
<td>monetary assessment (NA)</td>
<td>difficult to assess a monetary value</td>
<td>difficult to assess a monetary value</td>
</tr>
</tbody>
</table>
Table 7. Monetary capital model (discussed in section 2.5.1)

<table>
<thead>
<tr>
<th>National Wealth</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Having a composite indicator of sustainability allows for direct comparison between countries and regions</td>
<td>The weaknesses which are inherent in the ‘Net National Income’ calculations, and the strong sustainability perspective led to the conclusion that the NNI indicator should be complemented with an additional set of indicators that would compensate for these inherent weaknesses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difficult to assess monetary value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sum of National Wealth over all nations does not necessarily result in a sustainable world. NNI has a very narrow, national focus although there is net income from abroad included in the national wealth calculations.</td>
</tr>
</tbody>
</table>

d. Model-based approaches: DPSIR model

Another model-based approach is called the DPSIR-approach, which is particularly useful for policy-makers because it ‘offers a basis for analysing the inter-related factors that impact on the environment’ (website of the European Environment Agency). The meaning of the abbreviation is: Driving force, Pressure, State, Impact and Response. The driving force e.g. can be (the production of) an enterprise, which causes a pressure on the environment (pollution), in which case the state of the ground deteriorates. This state has impact in that way that there is economic damage because the soil can not be used for the building of houses. As a response the soil should be cleaned.

As a good example of this, the EEA presents the following figure.

![DPSIR Framework for reporting on environmental issues](image)

As the role of EEA is: To provide information on the DPSIR elements and their interconnections, and on the effectiveness of responses.

e. Some concluding remarks on indicator sets

The model-based as well as the policy-based approaches have preliminary a local/national focus since the indicator sets are mainly being made for nations, groups of nations or government units at lower than national levels. Therefore extra efforts need to be made in order to include the global and international perspectives. In these ways, both approaches have much the same departure points.
The issue of the time frame appears to be one of the main differences between these two approaches. Inherent in the nature of the model-based approach is a long-term time perspective. The policy-based approach, on the other hand, could be more of a short-term focus since the policy cycles are often a matter of a few years. However, based on experience with Eurostat Working Group on Sustainable Development Indicators, the change of the strategy did not have a huge impact on indicators as the headline indicators for the most part remained the same and only slight changes in the supplementary indicators occurred.

2.6 Indicators used by other countries

Because of a huge amount of sustainable development indicators in other countries and international organisations it is very difficult to compare them. Therefore the main goal of this part of the literature study was to provide a clear overview of the existing indicators. In this section only a summary is presented. For a detailed description see appendix 1.

In table 8 we present the indicators that have been employed by 4 or more countries/organisations. It can be seen that the amount of indicators which adhere to this criteria is almost equal for each dimension. However, the amount of indicators for each theme differs tremendously. For example theme ‘Sustainable production and consumption’ and ‘management of natural resources’ have 10 and 8 indicators respectively and themes ‘good governance’ and ‘global partnership’ only one. The ‘transport’ theme is the only one with no indicators at all. Possible explanations are that some countries lack data on some of these indicators or the countries have focussed on specific themes.
Table 8. Summary of the most used indicators per theme

<table>
<thead>
<tr>
<th>Theme: Socio-economic development</th>
<th>NA-consistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 GDP per capita</td>
<td></td>
</tr>
<tr>
<td>9 Public government gross net debt</td>
<td></td>
</tr>
<tr>
<td>7 Research &amp; Development expenditure (and/or patents)</td>
<td></td>
</tr>
<tr>
<td>6 Employment, by age group</td>
<td></td>
</tr>
<tr>
<td>5 Investment share of GDP</td>
<td></td>
</tr>
<tr>
<td>4 Inflation rate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Sustainable production and consumption</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Energy consumption by sectors</td>
<td>X</td>
</tr>
<tr>
<td>9 Energy use and intensity</td>
<td>X</td>
</tr>
<tr>
<td>8 Share of energy from renewable sources in total energy consumption</td>
<td>X</td>
</tr>
<tr>
<td>7 Domestic material consumption</td>
<td>X</td>
</tr>
<tr>
<td>6 Municipal waste collected and its disposal</td>
<td>X</td>
</tr>
<tr>
<td>5 Generation of industrial waste (by sectors) and its disposal</td>
<td>X</td>
</tr>
<tr>
<td>4 Recycling of waste (paper and glass, construction)</td>
<td></td>
</tr>
<tr>
<td>3 Consumption by chemical type</td>
<td></td>
</tr>
<tr>
<td>2 Generation of hazardous waste</td>
<td></td>
</tr>
<tr>
<td>1 Generation and disposal of radioactive waste</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Transport</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Theme: Global partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Official Development Assistance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Poverty and social exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Unemployment rate by age, gender, education level</td>
</tr>
<tr>
<td>11 Risk of poverty</td>
</tr>
<tr>
<td>10 Female to male wage ratio (gender pay gap)</td>
</tr>
<tr>
<td>9 Inequality of income distribution</td>
</tr>
<tr>
<td>8 Reptile names</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Public health</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Life expectancy (at birth)</td>
</tr>
<tr>
<td>6 Mortality (below the age of 65 and/or due to selected illnesses)</td>
</tr>
<tr>
<td>5 Population growth rate (sometimes regional)</td>
</tr>
<tr>
<td>4 Disability dependency ratio</td>
</tr>
<tr>
<td>3 Noise pollution (% of population exposed to traffic, railway and air traffic noise)</td>
</tr>
<tr>
<td>2 Working accidents (work-related injuries)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 The highest level of education attainment (by age group)</td>
</tr>
<tr>
<td>4 Access to the Internet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Good governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Voting activity (election participation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Climate change and air pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Emissions of greenhouse gases</td>
</tr>
<tr>
<td>6 Air pollution (air quality)</td>
</tr>
<tr>
<td>5 CO₂ emissions per capita and/or GDP</td>
</tr>
<tr>
<td>4 Emission of ozone precursors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Management of natural resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Biodiversity and number of protected species (birds, trees)</td>
</tr>
<tr>
<td>9 Agricultural area and organic farming</td>
</tr>
<tr>
<td>4 Area of protected land (to maintain biological density)</td>
</tr>
<tr>
<td>3 Development in areas of nature, woodland, housing and roads</td>
</tr>
<tr>
<td>2 Forest area and its utilization</td>
</tr>
<tr>
<td>1 Protection of surface water management (revegetation)</td>
</tr>
<tr>
<td>0 Quality of bathing and surface waters/ coastal eco-systems</td>
</tr>
<tr>
<td>0 Use of fertilizers and pesticides</td>
</tr>
</tbody>
</table>

$\times$ consistent with NA.
$\#$ work in progress
empty cells - data exists but consistency is basically not applicable
3. Possible strategies for Statistics Netherlands

In this section we will formulate the possible strategies which Statistics Netherlands can follow in order to measure (sustainable) welfare.

We advise that Statistics Netherlands will measure sustainable welfare by using a set of indicators at a macro economic level by means of indicators that focus on objective elements of welfare. This does not mean that we are not aware of the fact that the subjective aspects of life such as happiness or life satisfaction are of a great importance to people.

Regarding the critique with respect to GDP as a measure of welfare we agree with a lot of the arguments, however, we do not conclude that GDP cannot be used as one in a set of indicators of welfare. Consistent with the System of National Accounts 1993 (SNA93) GDP is a very good indicator for production activity and income but it was never meant to measure welfare. Therefore we are inclined to use GDP as one of the indicators in order to be able to determine welfare also because as SNA93 indicates in paragraph 1.69 “The consumption of goods and services, both individually and collectively, is one of the most important factors influencing the welfare of the community, but is only one of several factors.”

In section 2.5.2 we have presented the one number approach methods. We can conclude that these methods have two major disadvantages and therefore cannot be employed by Statistics Netherlands. First of all, welfare is characterized by many different dimensions which cannot all be monetarized into a single number. In our opinion there is a danger present that a composite index will oversimplify a complex system and give potentially misleading signals. Second of all, the way of determining the weights for indicators such as the HDI is very subjective and should be made by politicians rather than statisticians.

Based on the above conclusions we would like to propose 3 possible strategies that can be employed by Statistics Netherlands. It should be noted that in all proposed strategies Statistics Netherlands will base the method, as far as possible, on the national accounts.

3.1 Hybrid capital approach

The hybrid capital approach constitutes the first of the possible options to develop a set of indicators for sustainable welfare. The capital approach is based on the concept of maintaining economic, environmental, human and social capital over time for the future generations. By definition, capital encompasses those inputs that are necessary in economic processes and that endure in order to ensure the continuity of the economic system. The World Bank employed genuine savings (GS) in its (monetary) capital approach as it provides a much broader indicator of sustainability by valuing changes in natural resources, environmental quality and human capital in addition to the traditional measure of changes in produced assets provided by net saving (World Bank, 2006). The GS, however, is an indicator of weak sustainability and it can be characterized in the capital approach as a flow variable (thus all
changes in the capital such as capital formation, depreciation and other). Negative GS rates imply that total wealth is in decline; policies leading to persistently negative GS are unsustainable.

The capital approach suggests the need to measure stocks of each form of capital and their evolution over time. In the case of natural capital, it also implies the need to measure the demand for the environmental services (e.g. CO₂ absorption) to determine whether demand exceeds the capacity of ecosystems. This suggests an expansion of the traditional production function to include all forms of natural capital (not only resources) and the negative outcomes of the economic production (e.g. waste) that can lead to worsening in the functioning of ecosystems. Measurement of these resources means estimating the quantity and/or quality in physical and where possible monetary terms. Also in the case of human and social capital most indicators will have other units because it is difficult or impossible to produce appropriate monetary values.

Inherent in the nature of capital is a long-term time perspective. This approach does not change over time to some extent and is theoretically robust. The main weakness of this approach is the risk that it will be less politically relevant and could not be used when implementing any policy with respect to sustainable development. Further, the indicator set resulting from a capital model approach needs to be evaluated to be sure it includes an international or global perspective what constitutes another weakness of the capital model approach when looking at it from the policy-based approach.

A useful way of implementation of this strategy is to compare the capital approach to the sustainable development indicators employed either by Eurostat or other countries. In other words, if possible, different forms of capital will be measured by SDI’s. Thus the SD indicators will be divided into opening stock, flows (i.e. capital formation, depreciation and other changes) or closing stock. Only indicators that somehow match with the capital approach will be used.

The stocks of assets of the economic capital are measured according to SNA 93 conventions and those of natural capital according to the SEEA conventions. Regarding human and social capital the division in themes is based on the classification of the Working Group on Statistics for Sustainable Development (WGSSD).

3.2 Policy based approach

The next option refers to the so called policy based approach that has been already explained in section 2.2.3. The starting point here is the national strategy where the concept of sustainable welfare can be defined on basis of policy statements. Mostly, strategies with respect to the sustainable development are developed by the Ministry of Environment and therefore the most emphasis lies on environmental aspects of welfare. The advantage is that the indicators chosen for the various topics are relevant for policy directly. This approach however possesses a lot of disadvantages. One of these refers to the instability of this approach as political statements and policies are very likely to change relatively quickly what may lead to incomplete or
non-robust definition of sustainable development. This may also result in instability of the set of indicators what may cause difficulties when trying to track long-term trends for some phenomena since gathering of the data for new indicators can be costly and takes a lot of time. Of course it is not always like this because when looking for instance at Eurostat and participating countries when establishing the set of indicators based on the SDS, headline indicators did not change over time very drastically. Another disadvantage is that in the strategy some topics dominate other topics, so that the system is more or less incomplete.

If this approach is chosen, it is important to realize that the new government is still formulating its sustainable development strategy. Note also that if this option is chosen it will require a very large coordinating effort by Statistics Netherlands.

3.3 SDI sets in Dutch National Accounts setting

A third strategies would to base our indicator set on those of other countries or international organisation. In subsection 3.3.1 we propose a strategy which is based on international comparison of SDI’s. Subsection 3.3.2 investigates the Eurostat set of indicators and the possibility of making it consistent with national accounts. In the last subsection the possibility of adaptation of the German and Swiss method is discussed.

3.3.1 International comparison

One alternative is to base our choice of indicators on the literature study that we have done with respect to SDI’s of other countries and international organisations (for details see section 5.1 and 5.2). In table 8 in section 2.6 we have summarized the indicators per theme according to their frequency. We have chosen only indicators that were used by more than four countries/international organisations. Those indicators reflect what is internationally important with respect to sustainable development. Therefore they can be used for determining sustainable welfare in the Netherlands. It would not be wise to ignore the decision made by other countries when developing the conceptual frameworks for sustainable development. SDI sets usually come about after long deliberations. By comparing the outcome of these discussions this process can be made more efficient in the Netherlands as we have already defined the core of sustainable development in other countries and international organisations. For example, if almost all countries use greenhouse gasses as a headline indicator of climate change, it is unnecessary to have a discussion about that. Moreover the comparison between the Netherlands and other countries will be easier. If necessary the included indicators can be brought up for discussion with other parties. We have already checked whether the most frequently used indicators are either consistent with the National Accounts or can be potentially made consistent with NA. In the table in section 2.6 the results of this meta analysis are presented.
3.3.2 Eurostat SDI’s

This alternative is very similar to the previous one. The only difference is that in this case only the sustainable development indicators used by Eurostat will be checked whether they are consistent with the National Accounts. Thus also here the indicators that were based on the policy approach will be checked whether they are consistent with the National Accounts.

3.3.3 SDI sets of individual countries

The last alternative is the adaptation of the system of another country. Where necessary it should be adapted to the Dutch situation.

Due to the quality of the indicator system and the easy consistency with the national accounts, we would favour the methods of Switzerland (advanced methodology, strong theoretical background) and Germany (National Accounting) respectively.

3.3.3.1 Germany

Germany has set up a number of indicators according to the ‘three dimensions of sustainability’ system indicated in the table of section 2.5.1. Most of the indicators chosen are consistent with the German system of national accounts what constitutes the main strength of the German method. It should be noted that the approach of Germany stresses environmental indicators.

Germany uses 21 headline indicators and their choice has been based on the national strategy for sustainable development.

3.3.3.2 Switzerland

Switzerland uses a theoretically impressive system called MONET. The project was carried out in close collaboration by three federal offices.

Switzerland has looked how other countries have developed a system of indicators in order to prevent that Switzerland reinvented the wheel. The starting point for sustainable development was the well-known Brundtland definition. Further, Switzerland did not need to take into account geographic or administrative units under the federal level, as is mostly necessary in bigger countries like Germany (Länder) and France (départements). Finally, the selection of indicators was discussed with relevant organisations and experts (13 working groups, involving over 80 specialists).

In the key document 17 headline indicators are centred around four main topics:

- Meeting needs (how well do we live?)
- Fairness (how well are resources distributed?)
- Preservation of resources (what are we leaving behind for our children?)
- Decoupling (how efficiently are we using our natural resources?)
The topics contain 4, 3, 6 and 4 indicators respectively to give an impression of (sustainable) welfare in Switzerland.

To analyse the phenomena in more detail Switzerland devised a system including 163 indicators (of which 28 are not feasible owing to lack of data). The 163 indicators have been classified in 26 themes. Themes, in general, are classified according to topics which are relevant for sustainable development. Sometimes a classification is designed on the basis of procedures, instead of topics, where the focus is on ‘mechanisms and causal connections and attempts to record these in a model’.

Both of the approaches are of importance in an indicator system and therefore Switzerland has combined the two approaches by designing two classifications: one for themes and one for type of indicators. Each indicator belongs to a theme and to a category of type of indicator.

Five types of indicators are distinguished:

L = Level: Extent to which the needs of the individual and society are met. The variable can be a stock or a flow variable.

C = Capital: Status and potential of (environmental, economic and social) to resources. The variable is a stock variable.

IO = Input/Output: Flows originating from ‘capital’ in order to meet the needs described under ‘level’, together with appreciation or depreciation of ‘capital’ (e.g. through investment or pollutant emissions). The variable is a flow variable.

S = Structural criteria: Assessment of ‘in- and output’ relative to (economic, social and environmental) efficiency and of disparities in the meeting of needs (‘level’) or in the provision of ‘capital’. The variable is a stock variable.

R = Response: Social and political measures aimed at influencing in- and output. The variable is a flow variable.

The advantage of this strategy is that a rather quick survey of welfare in the Netherlands can be given on the basis of data which is mostly consistent with the national accounts. A disadvantage could be that the foreign systems of indicators are not applicable to the Netherlands.

3.3 Summary of the proposed strategies

Summarizing all the above proposed strategies it is also important to assess their external importance (significance). For example the WGSSD will probably propose the hybrid capital approach in its final report in 2008. The policy approach will be very interesting for VROM as they are preparing a new strategy and would like to cooperate with Statistics Netherlands. Eurostat would most likely want us to work on the Eurostat SDI set.
In Table 9 we have assessed the strategies based on a number of criteria. We have tried to assess each strategy on the following points: theoretical strength (is the strategy theoretically well underpinned?), policy relevance (is the strategy relevant for the policy in the country?), consistency with NA, dimension’s coverage plus balance (are the three dimensions well covered and the indicators equally divided per dimension?) and implementation possibility (is the effort to implement the system time consuming and is it easy to adapt to the Dutch situation?).

**Table 9. Assessment of the strategies**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Theoretical strength</th>
<th>Policy relevance</th>
<th>Consistency with NA</th>
<th>Dimension’s balance + coverage</th>
<th>Implementation possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.1 Hybrid capital approach</strong></td>
<td>Capital approach has a neat theoretical basis: inherent it is a long-term perspective</td>
<td>Role exists that capital approach is less policy relevant. In the case of the World Bank this approach connects to policy relevance. Another change is that the global and international perspective remain advocated.</td>
<td>Economic capital is entirely consistent with NA (BNV). Social capital with SEBS and thus as less possible with NA. Human and social capital not always</td>
<td>All three dimensions are well covered by the indicators and the balance between them is more or less equal</td>
<td>Capital approach is good abstracting tool for a framework. Capital approach does not exist but could be elaborated, it has to be elaborated, the human and social capital. It can result in indicators that are not policy relevant.</td>
</tr>
<tr>
<td><strong>3.2 Policy-based environmental strategy (GREED)</strong></td>
<td>Basics sustainable development theory (i.e. theory based on the three dimensions)</td>
<td>By definition</td>
<td>Timeliness between NA and policy-based indicators can occur, e.g. policy-based CO2 emissions differ from Kyoto figures</td>
<td>Depends on strategy but that some topics dominate other topics</td>
<td>The strategy is not the moment in the Netherlands</td>
</tr>
<tr>
<td><strong>3.3 SD sets in Dutch NA setting</strong></td>
<td><strong>3.3.1 International comparison</strong></td>
<td>Prognostic approach based on the frequency of indicators used internationally. Variables sustainable development theory as some countries have better theoretical underpinning than the other.</td>
<td>Policy relevant for the country but balance for the Netherlands possible.</td>
<td>A number of indicators is consistent with NA</td>
<td>All three dimensions are well covered by the indicators and the balance between them is more or less equal</td>
</tr>
<tr>
<td><strong>3.3.2 European SDGs</strong></td>
<td>Basics sustainable development theory (i.e. theory based on the three dimensions)</td>
<td>See above</td>
<td>A number of indicators is consistent with NA</td>
<td>All three dimensions are well covered by the indicators and the balance between them is more or less equal</td>
<td>It can be easily adapted to Dutch situation.</td>
</tr>
<tr>
<td><strong>3.3.3 Country SDGs sets</strong></td>
<td><strong>3.3.3.1 Germany</strong></td>
<td>Basics sustainable development theory (i.e. theory based on the three dimensions)</td>
<td>This strategy has a strong political relevance to Germany and its transferability to the Dutch situation is probably possible.</td>
<td>A number of indicators are consistent with NA</td>
<td>All three dimensions are well covered by the indicators and the balance between them is more or less equal</td>
</tr>
<tr>
<td><strong>3.3.3.2 Switzerland</strong></td>
<td>Very strong on two points. Strong theoretical basis and selection of indicators by means of a matrix combining capital elements and themes. Robustness of the system is very impressive as by means of discussions a lot of actors they developed their set of indicators from the theory to the policy relevant approach.</td>
<td>This strategy has a strong political relevance to Switzerland and its transferability to the Dutch situation is probably possible.</td>
<td>A number of indicators are consistent with NA</td>
<td>All three dimensions are well covered by the indicators and the balance between them is more or less equal</td>
<td>It can be quickly adapted to Dutch situation.</td>
</tr>
</tbody>
</table>
4. Conclusions

This paper provides an overview of the literature on welfare, wellbeing and sustainable development. Moreover the overview includes work done in other countries and international organisations.

The main aim of this paper was to propose/suggest a framework for sustainable welfare that is as general and comprehensive as possible and that can be used by science, general public as well as politicians and decision-makers. Therefore three strategies are suggested that could be employed by Statistics Netherlands. The reason for presenting more than one strategy is to bring them up for discussion with internal experts in order to choose the best option.
5. Appendices

5.1 Appendix 1. Description of indicators in other countries

In this section some preliminary results from the literature study that we have done so far with respect to the sustainable development indicators of other countries and international organisations will be presented. Due to the huge amount of indicators per country/organisation it is very difficult to compare them. Therefore the main goal of this part of our research was to provide a clear overview of the existing indicators in other countries.

The following steps have been undertaken when selecting the countries and organisations:

- Only those countries have been selected that presented their indicators (implicit or explicit) using three dimensions: economic, social and environmental. I will come back to this issue later in the presentation.
- Only the sets of indicators coming from official government agencies such as statistical bureaus or ministries have been selected.
- Finally, only the indicators from countries that are more or less comparable to the Netherlands with respect to the economic development have been taken into analysis. Hereby it should be noted that we have heavily relied on the article from Julie Hass and Thorvald Moe “Challenges in establishing sustainable development indicators” written for the meeting in Oslo 2006. This article includes an updated list of SDI’s, presented in the form of the table using the classification of the country.

1. Setting up the table

In our main table (appendix 2) the crossing has been made between the indicators and countries/organisations. When filling in the table we have bundled similar indicators that describe the same phenomena under one name (we have grouped indicators which we deem to be similar). For example indicators such as GDP per capita, (regional) GDP in Purchasing Power Standards or GDP growth have been put together under one indicator “GDP per capita”. Moreover the indicators that describe the same phenomena but were subdivided into categories (gender, age, educational level etc.) have been placed under one denominator where the break down (subdivision) is no longer visible. We could not avoid subjective assessment because we divided the indicators into themes and sub-themes only on basis of their names. Due to the time restriction, investigation of every single definition was impossible. The same subjective assessment applies for grouping similar indicators. In case of doubt the indicators were kept separate what explains a great number of indicators that were only mentioned once. In the third column the frequency of the indicators per sub-theme is given.
2. Limitations

Hereby some limitations will be pointed out. In the case of Switzerland and Finland we did not include all indicators because they were not included in the article of Hass and Moe. For example, in the case of Finland 50 SD indicators were omitted and Denmark 38. For Switzerland, only 17 headline indicators were included.

3. Classification of the dimensions

In the table below the classification of dimensions, themes and sub themes is given. Although it is a preliminary division of work in order to be able to group the SD indicators. There are three general dimensions upon which the sets of indicators are based, namely: economic, social and environmental. Due to a huge amount of indicators per dimension we have decided to divide the dimensions further into 10 themes en 32 sub themes. As a point of departure was here the classification made by Eurostat in the Monitoring Report (2005), however we have changed or renamed it partly and made our own classification because some categories were in our view not applicable for the overview. As already mentioned we could not avoid subjective assessment because the indicators were grouped into themes and sub-themes only on basis of their names.

Classification of dimensions and (sub-)themes

4. Distribution of the indicators per dimension

In the chart below (chart 1) the percentage of indicators per dimension is given. The real value of this chart is rather limited as the subjective assessment with respect to the division of the indicators could not be avoided. The chart is meant only for a rough picture of the scope of the dimensions.
As it can be roughly seen in the above chart 40% of the indicators belongs to social dimension, 33% to the environmental dimension. The rest, 27%, belongs to the economic dimension.

5. Percentage of indicators per dimension by country

In chart 2 the percentage of indicators per dimension for each country is given. What is very striking is that in the case of Denmark and Portugal the emphasis lays on the environmental dimension. On the other hand, when looking at Switzerland and United Nation’s Millennium Indicators, the environmental dimension constitutes a smaller part when compared to the other dimensions in those countries.
Summarizing, our preliminary results show the indicators which most countries adopt. The distribution of the SDI’s is almost equal per dimension, however the number of indicators is unequal per theme. Despite the above mentioned limitations, the acquired knowledge from this study will be helpful when developing the conceptual framework of sustainable welfare in the Netherlands. It would not be wise to ignore the decision made by other countries when developing the conceptual frameworks. Moreover the comparison between the Netherlands and other countries will be easier.

SDI sets come through long discussion, by comparing the outcome of these discussions in other countries we hope to make the process more efficient in the Netherlands
## 5.2 Appendix 2. Indicators other countries and international organisations

<table>
<thead>
<tr>
<th>Objective</th>
<th>Indicators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase access to energy services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to clean water and sanitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to health services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to social services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to information and communication technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to financial services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to land-use rights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to market access opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase access to legal and judicial protection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2. Sustainable production and consumption

- **Agriculture**
  - Increase in realised gross value added
  - Increase in area under cultivation
  - Increase in area under irrigation
  - Increase in area under mechanisation
  - Increase in area under biotechnology
  - Increase in area under organic farming
  - Increase in area under agroforestry
  - Increase in area under agroecology
  - Increase in area under agroecology

- **Forestry**
  - Increase in deforestation
  - Increase in forest cover
  - Increase in forest carbon storage

- **Fisheries**
  - Increase in fish catch
  - Increase in fish exports
  - Increase in fish processing

- **Mining**
  - Increase in mineral production
  - Increase in mineral exports

- **Energy**
  - Increase in energy production
  - Increase in energy consumption

- **Water**
  - Increase in water use efficiency
  - Increase in water productivity

- **Waste**
  - Increase in waste generation
  - Increase in waste recycling

### 3. Targeted outcomes

- **Food security**
  - Increase in food security
  - Increase in food access
  - Increase in food utilization

- **Nutrition**
  - Increase in nutrition status
  - Increase in malnutrition prevalence

- **Income**
  - Increase in income
  - Increase in income inequality

- **Employment**
  - Increase in employment
  - Increase in unemployment

- **Education**
  - Increase in primary school enrolment
  - Increase in secondary school enrolment

- **Health**
  - Increase in life expectancy
  - Increase in health outcomes

- **Environment**
  - Increase in environmental sustainability
  - Increase in biodiversity

### 4. Shared pathway

- **Sustainable development**
  - Increase in sustainable development indicators

- **Indicators other countries and international organisations**
  - Increase in international co-operation
  - Increase in international aid

- **Partnerships**
  - Increase in partnerships
  - Increase in participation

- **Capacity building**
  - Increase in capacity building
  - Increase in human resources
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy and institutional frameworks</td>
<td>DESCRIPTION OF EACH FRAMEWORK, INCLUDING GOVERNMENT POLICIES, REGULATIONS, AND STANDARDS RELATED TO THE TOPIC.</td>
</tr>
<tr>
<td>Fiscal and financial frameworks</td>
<td>DESCRIPTION OF FISCAL AND FINANCIAL MECHANISMS, INCLUDING BUDGETING, TAXATION, AND LOAN PROGRAMS, THAT IMPACT THE TOPIC.</td>
</tr>
<tr>
<td>Legal and regulatory frameworks</td>
<td>DESCRIPTION OF LEGAL AND REGULATORY MECHANISMS, INCLUDING LAWS AND REGULATIONS, THAT IMPACT THE TOPIC.</td>
</tr>
<tr>
<td>Technical and operational frameworks</td>
<td>DESCRIPTION OF TECHNICAL AND OPERATIONAL MECHANISMS, INCLUDING TECHNOLOGY AND PROCEDURES, THAT IMPACT THE TOPIC.</td>
</tr>
<tr>
<td>Public and private sector frameworks</td>
<td>DESCRIPTION OF PUBLIC AND PRIVATE SECTOR MECHANISMS, INCLUDING PARTNERSHIPS AND COLLABORATIONS, THAT IMPACT THE TOPIC.</td>
</tr>
<tr>
<td>Other frameworks</td>
<td>DESCRIPTION OF OTHER MECHANISMS, INCLUDING INTERNATIONAL AGREEMENTS AND STANDARDS, THAT IMPACT THE TOPIC.</td>
</tr>
<tr>
<td>Network</td>
<td>Wildlife, climate and air pollution</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td></td>
<td>Abnormalities (biomedical symptoms)</td>
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<tr>
<td></td>
<td>Air pollution, air quality</td>
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<td></td>
<td>Emissions of air pollutants</td>
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<td></td>
<td>Climate change and air pollution</td>
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</tbody>
</table>

### Network Components
- **Abnormalities (biomedical symptoms)**
- **Air pollution, air quality**
- **Emissions of air pollutants**
- **Climate change and air pollution**

### Key Elements
- **Abnormalities (biomedical symptoms)**
  - Childhood abnormalities
  - Disease and injury
- **Air pollution, air quality**
  - Air quality
  - Climate change
- **Emissions of air pollutants**
  - Emissions of pollutants
  - Human activity
- **Climate change and air pollution**
  - Climate change
  - Air pollution

### Additional Notes
- **Abnormalities (biomedical symptoms)**
  - Childhood abnormalities
  - Disease and injury
- **Air pollution, air quality**
  - Air quality
  - Climate change
- **Emissions of air pollutants**
  - Emissions of pollutants
  - Human activity
- **Climate change and air pollution**
  - Climate change
  - Air pollution
<table>
<thead>
<tr>
<th>Sources:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia: Hass et al., 2006</td>
</tr>
<tr>
<td>Austria: Monitoring SD, 2006</td>
</tr>
<tr>
<td>Czech Republic: Hass et al., 2006</td>
</tr>
<tr>
<td>Denmark: Hass et al., 2006, still 38 indicators (sectors)</td>
</tr>
<tr>
<td>Finland: Hass et al., 2006, still 50 additional indicators</td>
</tr>
<tr>
<td>France: 12 high level SDI's, situation as of December 31st 2006</td>
</tr>
<tr>
<td>Hungary: Hass et al., 2006</td>
</tr>
<tr>
<td>Luxembourg: Hass et al., 2006</td>
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<tr>
<td>Norway: Hass et al., 2006</td>
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<tr>
<td>Portugal: Hass et al., 2006</td>
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<td>Sweden: Hass et al., 2006</td>
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<tr>
<td>Switzerland: Sustainable Development: A Brief Guide, 2005</td>
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<tr>
<td>UK: Hass et al., 2006</td>
</tr>
<tr>
<td>Eurostat: Monitoring report, 2006</td>
</tr>
<tr>
<td>UN (SDI and Millennium Indicators): Hass et al., 2006</td>
</tr>
</tbody>
</table>
5.3 Appendix 3. Additional literature

Hereby we present an additional list of articles that were useful for our study, but have not explicitly mentioned in the main text of this paper. Therefore they are not mentioned in the references.

SNBI/ISEW/GPI

2. Lawn, P., (2003), ‘A theoretical foundation to support the Index of Sustainable Economic Welfare (ISEW), Genuine Progress Indicator (GPI), and other related indexes’, Ecological Economics 44, pp. 105-118
3. Lawn, P., (2005), ‘An assessment of the valuation methods used to calculate the index of sustainable economic welfare (ISEW), genuine progress indicator (GPI), and sustainable net benefit index (SNBI)’, Environment, Development and Sustainability 7, pp. 185–208

ISEW/GPI

ISEW


HDI


Welfare


Genuine Savings


**Capability Approach**


**Critique with respect to GDP**


**Sustainability (Weak/ Strong Sustainability)**

31. Daly, H., (1992), ‘Allocation, distribution, and scale: towards an economics that is efficient, just, and sustainable’, Ecological Economics, 6, pp.185-193
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32. SEEA (2003), ‘Integrated Environmental and Economic Accounting 2003’, Final draft circulated for information prior to official editing


