AN ANALYSIS OF ALTERNATIVE OBJECTIVE MEASURES OF ECONOMIC PERFORMANCE AND SOCIAL DEVELOPMENT

MSAWENKOSI MADODA HLANTI

STUDENT NUMBER: 605H4714

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DEPARTMENT OF ECONOMICS AND ECONOMIC HISTORY, RHODES UNIVERSITY, GRAHAMSTOWN

SUPERVISOR: MR EBRAHIM SEEDAT

DECLARATION

Except for references specifically mentioned in the text, this thesis is entirely my own work and has not been submitted to any other institution for degree purposes.

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Msawenkosi M. Hlanti **Date**

ABSTRACT

The measurement of economic performance and social development has become increasingly important as societies have evolved and become more complex. At present nations do not only seek to improve economic performance but are also compelled to improve social development through improvements in socially and environmentally sustainable initiatives. Traditional measures such as Gross Domestic Product (GDP) which is derived from United Nations' System of National Accounts (SNA) have been criticised given the inability to adequately account for these social and environmental aspects of social development.

Given these perceived deficiencies in the conventional measures, several alternative objective measures have been proposed in an attempt to address these shortcomings. Therefore the primary aim of this study is to analyse, via a literature survey, these alternative objective measures of economic performance and social development. The alternative measures that constitute the survey are the Index of Sustainable Economic Welfare (ISEW), the Genuine Savings (GS), and the United Nations' Human Development Index (HDI).

Upon the completion of the literature survey, sustainable development theory is used to evaluate the extent to which the National Accounts and the alternative objective measures are consistent with Hicksian and Fisherian definitions of income and capital, which embody the concepts of sustainability and sustainable development. The evaluation reveals that the National Accounts neither conform to the Hicksian nor the Fisherian definitions of income, thus could not be viewed as a measure of sustainable income. It is found that the ISEW is consistent with the Fisherian definition of income and is also a partial indicator of sustainable development. The evaluation of the GS measure reveals that it is consistent with the Hicksian definition but not the Fisherian definition. In terms of overall sustainability, it is argued that GS is a partial measure of *weak* sustainability. The HDI is similar to the National Accounts, in that it is neither consistent with the Hicksian nor the Fisherian definitions of income and is also not a measure of sustainability.

In summary, the study demonstrates that despite GDP's shortcomings as a measure of economic performance and social development, currently, there is no alternative approach which simultaneously addresses every flaw in GDP. However, all the alternatives yield a much better approximation of social development than GDP.

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CHAPTER ONE

INTRODUCTION

1.1 CONTEXT OF THE STUDY

Globally it has become common to monitor and assess performance, whether of individuals, firms or countries (Sen, Stiglitz and Fitoussi, 2009). Performance measurements have become increasingly important as societies have become more performance-oriented and as such, this has led to the design of comprehensive measures to monitor and assess the performance of society as a whole. Sen *et al.*, (2009:8) state that these performance measures affect the actions or decisions which are taken by society. In addition, the goals of a society also affect what is measured, thus, there is an intricate relationship between goals, measures and actions.

This is particularly true when understood in the context of countries' policy decisions aimed at achieving specific economic and social objectives. Sen *et al.,* (2009:8) mention that policy-makers have a mandate to improve the economic performance of a country (usually through sustained real GDP growth) while also ensuring social development[1] through improvements in education, health and environmental protection. Oswald (1997:1815) mentions that these two objectives are sometimes perceived to be unattainable when pursued concurrently whereby social initiatives are viewed as obstacles to achieving economic objectives; Oswald (1997:1815) however states that this notion of conflicting objectives is intuitively incorrect since the fundamental role of economic growth is to impel social development.

Van den Berg (2009:118) states that the measurement of economic performance and social development in countries, including cross-country comparisons, has often implicitly and even explicitly, been expressed in terms of the respective countries' Gross Domestic Product (GDP) or GDP per capita.[2] Economists such as Samuelson (1961), Nordhaus and Tobin (1972), Easterlin (1974) and Sen *et al*., (2009), amongst others, have criticized the notion of GDP being used and interpreted as a measure of social development. The main criticisms of

[1]The term social development is used loosely in this study and is also intended to encompass social, economic and environmental sustainability.

[2]GDP is the market value of all final goods and services produced in a country over a period of time, while real GDP per capita (corrected for inflation), is generally used as the core indicator in judging the position of the economy of a country over time or relative to that of other countries (Van den Bergh, 2009:117).

GDP emanate from the notion that it does not distinguish between economic activities that improve social and economic development and those that impair it, furthermore it also omits the measurement of social, economic and environmental sustainability.

Despite these growing criticisms of GDP, most economists however, agree that GDP is still a valuable economic tool in terms of capturing data on market activity and monetary transactions in the economy (Wen, Zhang, Du, Li and Li, 2007:463). For instance, Sen *et al*., (2009:27) suggest that GDP is indispensable as a measure of economic performance because it belongs within an internationally standardized accounting framework[3] and is a concept which is widely recognized and used. However, Sen *et al.*, (2009:27) also note that despite these advantages, GDP still requires refinement as a measure of economic performance and should be supplemented by other concepts in order to capture excluded economic factors such as income distribution within households, leisure, the informal sector and volunteer work.

These limitations of GDP, amongst others, have resulted in the proposal of various alternative measures of economic performance and social development over the years. For example, Van den Bergh (2009:124) identifies three prominent categories of alternative indicators available in literature[4]. The first category involves measures that make accounting adjustments to GDP in an attempt to repair important deficiencies through adding or subtracting certain partially calculated money amounts to and from GDP. The measure that laid the foundation for such measures was proposed by Nordhaus and Tobin (1972). The Measure of Economic Welfare (MEW) proposed by Nordhaus and Tobin (1972) focused on the reclassification of GNP[5] to reflect consumption rather than production. This reclassification involved adding the value of household services and leisure while subtracting the cost of capital consumption and negative externalities such as pollution and also excluding, for example, regrettable expenditures such as police services to combat crime and military defense expenditure.

[3]See UN (1993)

[4]These are the three alternative measures that one has chosen to form part of the literature survey and they have been chosen due to their prominence in literature regarding this topic. It is worth mentioning that there is an array of literature that focuses on subjective/happiness economics which has been intentionally excluded from the study due to the limitations of the scope of the study.

[5]Gross National Product (GNP) is similar to GDP except that it measures the monetary value of goods and services annually produced by domestically owned rather than domestically located factors of production (Lawn, 2003:106).

Stockhammer, Hotchreiter, Obermayr and Steiner (1997:24) mention that the revised and modern version of the MEW is the Index of Sustainable Economic Welfare (ISEW) proposed by Daly and Cobb (1989) and Cobb and Cobb (1994). Beca and Santos (2010:810) state that the ISEW is an index intended to measure sustainability and economic welfare in a way that avoids the limitations of GNP/GDP by accounting for the value of externalities, the distribution of income and natural resource depletion. Wen *et al.*, (2007:464) mention that the ISEW has also been revised over the years and given a variety of names such as the Genuine Progress Indicator (GPI) (Anieleski and Rowe, 1999), and the Sustainable Net Benefit Index (SNBI) (Lawn and Sanders, 1999). Different versions of the ISEW have been derived for various countries[6]and despite some methodological differences and/or availability of data, the ISEW analyses show that in most countries studied, the ISEW (economic welfare) increased in the early parts of the study period and then began to decline despite continued growth of per capita GNP. Lawn (2003:106) explains that this trend is due to continued economic growth in these countries often reaching a point where the costs of the growth outweigh the benefits. Thus, growth is inimical to economic and social welfare. Max-Neef (1995:117) suggests that the ISEW studies undertaken are a good representation of the "Threshold Hypothesis" (also see Anieleski, 1999:3 and Niccolucci, Pulselli and Tiezzi, 2007:671).

The "Threshold Hypothesis" states that for every society there seems to be a period in which economic growth (as measured by real GNP/GDP growth) militates infavour of the quality of life of the people, but only up to a point (the threshold point). Beyond this point, if there is more economic growth, quality of life may begin to deteriorate (Max-Neef, 1995:117).The method used for ISEW/GPI studies has however been criticized by some authors, including England (1998:101) who suggests that the results observed from the application of the ISEW in these countries may simply reflect a repeated application of the same imperfect method rather than offering sufficient evidence of the existence of a threshold point where economic growth lowers the quality of life. Other notable critics of the ISEW/GPI method include Nordhaus (1992), Atkinson (1995) and Neumayer (1999; 2000).

The second alternative objective measure is the 'Genuine Savings' (GS) indicator which was proposed by Pearce and Atkinson (1993)[7] as a measure of '*weak* sustainability'. Hanley,

[6]Examples include the USA (Daly *et al*., 1989), Australia (Hamilton, 1999), Austria (Stockhammer *et al.,* 1997), Chile (Castaneda, 1999), Italy (Pulselli, Bravi and Tiezzi, 2011), Sweden (Jackson and Stymne, 1996) and the United Kingdom (Jackson *et al*., 1997).

[7]The measure was later adopted and revised by the World Bank (1997).

Moffatt, Faichney and Wilson (1999:58), mention that the GS measure is essentially an empirical application of the "Hartwick Rule"[8]. The measure tests whether a country is following the "Hartwick Rule" by comparing the national savings rate with the sum of depreciation on natural and human-made capital, all expressed as a fraction of national income. Pearce and Atkinson (1993:103) argue that if all savings are re-invested in these two forms of capital then the aggregate capital stock will not decline, and a constant consumption stream can be maintained, of which the authors take to be synonymous with sustainable development.

Pillarisetti (2005:600) states that the GS measure is referred to as a '*weak* sustainability' measure because it is conceptually based on the notion of perfect substitutability between different types of capital, thus natural and human-made capital are essentially regarded as identical in their ability to produce welfare, therefore it follows that natural capital can be allowed to decline so long as human-made capital is increased as compensation for the decline. Pearce and Atkinson (1993:105) state that if countries fail this *weak* test of sustainability, they cannot pass a sterner test. Everett and Wilks (1999:4) mention that the advantage of using this indicator is that it gives a single positive or negative figure, for example, persistent negative figures indicate that the country is pursuing an unsustainable path that will be detrimental to welfare and development in the long-run. This measure has, however, been criticized by various authors. Hanley *et al*., (1999:59) mention that measuring the depreciation of natural capital is empirically difficult especially taking into consideration that much of the resources that form part of natural capital have no or imperfect market values. In addition Hanley *et al*., (1999:59) criticize the implicit assumption of perfect substitutability in the construction of the measure, stating that it is highly implausible that the different types of capital (natural and human-made) could be substitutes. Beckerman (1994:203) also notes that since GS is a '*weak* sustainability' measure, it is intrinsically biased in favour of high-income countries, where high levels of financial savings and of investment in human capital can, theoretically, more than offset the depletion of the national stock of natural resources thus allowing the countries to continue on a 'sustainable' path.

[8]The "Hartwick Rule" requires that rents from natural resource extraction be re-invested in human-made capital to keep the total amount of capital (natural plus human-made) from declining (Hartwick, 1977).

The third category of alternative objective measures includes indicators that attempt to assess social development more directly than GDP. Unlike the previous types of indicators, these indicators do not generate a monetary value but rather seek to assess average human satisfaction and basic human functions. Schepelmann, Goosens and Makipaa (2010:31) state that the best known example of this type of measure is the United Nations (UN) Human Development Index (HDI). The HDI aggregates a number of components, including GDP per capita, life expectancy at birth, adult literacy rate, combined primary, secondary, and tertiary gross enrollment ratios. The array of components that constitute the HDI has raised questions regarding the quality of data included in the measure, for example, Morse (2003:285) mentions that the use of an indicator such as GDP per capita as a proxy for average income can be suspect as it does not take into consideration income distribution within a country. Other authors such as Neumayer (2001:104) have proposed that the HDI be supplemented with components which would account for environmental factors, thus making the HDI measure a better index of development. It is worth mentioning that other approaches such as the Human Poverty Index, the Gender-related Development Index; Ecological Footprint (EF) and the Happy Planet Index (HPI) also fall under this category.

Given the problems associated with using GDP as a comprehensive measure of economic performance and social development, it is important to analyse the alternative measures available to policy-makers as they attempt to guide economic and social development in their respective countries.

1.2 THE OBJECTIVES OF THE RESEARCH

The broad goal of the study is to provide a comprehensive literature survey of the existing and alternative measures of economic performance and social development. Therefore the study will attempt to:

i. Evaluate and summarize relevant theoretical issues regarding measures of economic performance and social development.

ii. Evaluate objective measures of economic performance and social development which comprise:

a. National accounts measures such as GDP and its variants as defined by the System of National Accounts (SNA).

b. Proposed alternative measures in particular, the ISEW, GS and HDI.

1.3 METHOD AND ORGANISATION OF THE STUDY

To achieve the objectives of the research, a survey of the literature pertaining to the objective measures of socio-economic development will be conducted. Upon the completion of the literature survey, Sustainable Development theory is used to evaluate the extent to which the National Accounts and the alternative objective measures are consistent with Hicksian and Fisherian definitions of income, which in this study are regarded as encompassing the concepts of sustainability and sustainable development.

The remainder of this study will be organized as follows. Chapter 2 contains a discussion of issues in National Accounts (i.e. SNA and GDP) measurement. Chapter 3 evaluates the alternative objective measures of economic performance and social development. Chapter 4 compares the National Accounts and objective measures against Sustainable Development theory. Chapter 5 concludes the study.

CHAPTER TWO

NATIONAL ACCOUNTS AND GDP

2.1 INTRODUCTION

The System of National Accounts (SNA) or national accounts framework comprises accounting standards used in measuring the economic activity of a nation. Ward (2006:328) states that national accounts present information about domestic output, trade in goods and services, savings, investment and taxes, and how these variables are inter-linked with each other within the domestic economy and the global economic environment.

Bos (2009:32) states that the development of a formal and standardized national accounts framework can be divided into four generations of international guidelines[9]. The first generation is the period between 1947 and 1953 which included the publication of the 1947 UN report, the 1951 OEEC report and consequently the 1953 UN, SNA (SNA53). The second generation is the period between 1968 and 1970 which corresponded with the publication of the UN (SNA68). The third generation is between the period 1993 and 1995 and culminated with the publication of the UN (SNA93). The fourth generation is the period between 2008 and 2010 which also led to the publication of the UN (SNA08).

Bos (2009:31) states that the 1947 UN technical report was the first attempt by an international body to provide a detailed national accounting system. Bos (2009:31) mentions that even though the report was written on behalf of the UN, the national accounting system that was recommended by the report suited an advanced industrial economy rather than an economy of a less developed country. In addition Bos (2009:31) states that the report was also much more concerned with elaborating on the purposes and usefulness of national accounting rather than providing a concrete system. In 1951, the OEEC (predecessor of the OECD) published guidelines on a new system of national accounts which were called "Simplified System of National Accounts". This version of the national accounts attempted to be a simplified system as it only distinguished between a current account and a capital

[9]It is worth mentioning that the European Standard Accounts (ESA) and Material Product System (MPS) made important contributions towards the formation of international guidelines but are however beyond the scope of this study.

account and it only included three sectors (government, firms and households) without any division into sub-sectors. The UN published a national accounting guideline in 1953 called "A system of national accounts and supporting tables". This guideline was later referred to as the first SNA (SNA 53). The SNA 53 consisted of simple tables and accounts. Muller (2003:39) mentions that the SNA 53 was largely based on the recommendations and conclusions of the previous two national accounts guidelines (i.e. the 1947 UN technical report and 1951 OEEC guidelines). Bos (2009:35) states that the main distinguishing aspect of the SNA 53 was that the tables showed the decomposition of the selected items, thereby, increasing the scope of the system. Muller (2003:40) also mentions that in contrast with the 1947 UN report and 1951 OEEC, the SNA 53 was less focused on advocating the use of the national accounts framework but instead seemed to focus on broad totals and how information should be recorded to achieve these totals.

The second generation of international guidelines included the publication of the 1968 SNA (SNA 68). This was a more detailed and extended 'System of National Accounts'. Bos (2009:32) mentions that the SNA 68 was much more flexible than the SNA 53 and allowed for countries to adapt the system as they saw fit to suit their economies. Bos (2009:32) mentions that this flexibility was especially useful for developing countries, for example a separate chapter was included with some classifications regarding the distinction between urban and rural areas and also between modern and traditional modes of production. Ward (2006:332) states that for the first time in the SNA 68 there were also recommendations concerning input-output tables[10], financial accounts and general principles on prices and volumes. Ward (2006:333) states that the SNA 68 guideline showed how input-output tables could be fitted in a complete system of national accounts by using a matrix (commonly referred to as National Accounting Matrix) to present an overview of the whole national accounting framework. A full set of financial accounts were also introduced for the first time in the SNA 68. Ward (2006:332) mentions that price and volume data were also introduced for the first time in the SNA 68 and another important feature of this guideline was that it attempted to address the problem of deflation within the context of a complete set of accounts. In addition, the SNA 68 also discussed the issue of measuring real national income when terms of trade are changing. Bos (2009:38) states that even though SNA 68 represented an improvement to the previous version (i.e SNA 53) it was still inaccessible to many users

[10]Input-output tables are an integral part of the production account in the SNA which give a snap-shot of the structure of relations between an economy's agents (Yu, Masakova and Tatarinov, 2007:1).

since key concepts were not defined rigorously but rather by enumeration. Thus, the clarification and expansion of fundamental concepts such as prices, volumes and income distribution was still required.

The SNA 93 represents the third generation of international guidelines and brought with it several unprecedented changes to the national accounting framework, particularly with regards to the measurement of social and environmental factors. The SNA 93 introduced balance sheets, purchasing power parities, a more detailed accounting structure, detailed discussions of general principles on prices and volumes and most importantly separate chapters on satellite accounts. Bos (2009:33) mentions that the SNA 93 could be regarded as the first truly universal system of national accounting as it was drafted under the joint cooperation between the UN, World Bank, IMF, OECD and the EU. In addition to the financial accounts which were introduced in the previous version of the framework (i.e. SNA 68), the SNA 93 introduced for the first time, balance sheets into the national accounting system. Moreover, other accounts were expanded. For example in the SNA 68 only one account was used for describing the distribution and use of income, while in the SNA 93 six accounts were used.

Ward (2006:333) states that the SNA 93 also contained a detailed discussion of general principles on prices and volumes by identifying the appropriate price vectors and underlying price matrices that should be used in different sectors to deflate current price estimates in order to define the precise boundaries of production and the nature of real output. Purchasing power parities (PPP's) were also included for the first time in the SNA 93 version. In addition to these improvements to the SNA 93, the most important addition to the SNA 93 framework (with respect to this study) were the introduction of the separate 'Satellite Accounts'.

Jackson and McBride (2005:6) state that the SNA 93 was the first internationally accepted national accounting guideline that attempted to widen the scope of the conventional national accounts to incorporate data and indicators relating to environmental and social factors under the name of 'Satellites Accounts'. The SNA 93 included a detailed System of Integrated Economic and Environmental Accounting (SEEA 2003) which brings together economic and environmental information. Jackson and McBride (2005:6) state that the aim of the SEEA 2003 was to provide policy-makers with statistics to monitor the interactions between the economy and environment, as well as providing a database for strategic planning and analysis

to identify more sustainable paths of development. These accounts are designed to supplement the SNA framework therefore; economic aggregates are complemented by additional environmental and/or social information. Jackson and McBride (2005:7) however, mention that there has been no systematic implementation of the SEEA across the world but individual countries have developed various versions of satellite accounting with some of them based on the UN SEEA recommendations. Examples of these satellite accounts include the German Environmental Economic Accounting (GEEA), System of Economic and Social Accounting Matrices and Extensions (SESAME), various Sustainable Development Indicators (SDI's), Political Freedom Indicators and Gender Inequality Indicators (Schepelmann *et al.,* 2010:64). Jackson and McBride (2005:7) state that the fundamental issue that arises with the consideration of these different satellite accounts is that they reflect different development objectives which may confuse policy-makers. Thus, it has been suggested that one way of overcoming this obstacle would be to aggregate separate components of satellite accounts into a single index, of which, some of the proposed alternative objective measures discussed later in this study have attempted to do.

The SNA 08 forms the latest international guideline to national accounting. Bos (2009:34) mentions that the framework is an extension of the SNA 93 and merely elaborates and clarifies certain issues that arise in the SNA 93. Some of the concepts and issues clarified in the SNA 08 include discussing the perspective of various sectors such as measuring corporate activity, general government on public sectors, non–profit institutions, household sectors, world accounts and links to monetary and financial statistics. Furthermore, new chapters were introduced concerning capital services and the informal economy.

As mentioned before, the most prominent and widely used measure within the SNA is Gross Domestic Product (GDP).[11] Schepelmann *et al.*, (2010:19) state that the appeal of the GDP measure lies in its simplicity, they mention that GDP has been universally accepted as the standard measure of macroeconomic activities and over the years has been positioned as the core economic and social management tool and as such has influenced socio-economic analysis, policy formulation and decision-making. The extent of this influence has, however, come under criticism from economists. As alluded to earlier, the main criticisms of GDP are usually directed towards its inability to separate between activities that improve social and

[11]The rest of the study will deal with the issue of GDP, with the assumption that what applies to GDP will broadly apply to the other national accounts measures (i.e. GNP) too.

economic development and those that impair it, and also its inability to account for social, economic and environmental sustainability.

Bos (2009:20) mentions that before the construction of such measures, policy-makers mostly relied on individual data sets such as industrial production and stock indices in an attempt to determine overall economic activity. These data sets coupled with the increasing role of the government in the economy, however, prompted the need for a more comprehensive set of data to be used in order to assess national economic performance.

Costanza, Hart, Posner and Talberth (2009:5) mention that GDP was entrenched as the core measure of economic performance during the Bretton Woods conference of 1944. The main aim of the conference was to create a process of economic and political co-operation, specifically on currency exchange and trade. The two major outcomes of the conference was the establishment of the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (which is now part of the World Bank). Costanza *et al.*, (2009:6) note that both these institutions adopted GDP as the main tool to guide economic policies and also to determine which projects or countries required funding and support.

As a consequence of these actions, policy-makers, economists and the media began to (and still) regard GDP or GDP growth as the primary means of measuring economic performance and social development (Schepelmann *et al.*, 2010:15). The issue of whether this approach is erroneous will be considered below.

2.2 THEORETICAL ISSUES

Bos (2009:261) states that the current SNA framework is well designed and in many ways is similar to an economic model. These similarities include the SNA's distinction between financial and non-financial transactions, the distinction between taxes and purchase of services and also its preference for market values. Bos (2009:261) also mentions that the framework also encompasses economic concepts such as price discrimination for distinguishing prices and volumes.

Bos (2009:261) states that the SNA's description of economic activities is, however, closer to some economic theories than to others. For example Bos (2009:261) mentions that it is closer

to notions of Keynesian theory than to welfare and microeconomics and this is reflected by the categorisation of the government sector, public and private sector corporations and the concept of household consumption expenditure within the GDP framework. Bos (2009:261-262) also adds that the SNA ignores micro and welfare-related issues such as income distribution, the so-called informal sector of an economy, economic and environmental sustainability issues and focuses instead on activities that are readily measured in monetary terms.

Sen *et al*., (2010:34-35) mention that income would be a better measure of economic performance than output which underlies GDP. Lawn (2005a:4-8) agrees with this notion and states that a good measure of national income should be able to satisfy either the Hicksian or Fisherian definition of income.

Hicksian income is defined as the maximum amount that can be produced and consumed in the present without compromising the ability to do likewise in the future (Lawn, 2006:442). Lawn (2006:442) mentions that the most attractive aspect of this definition is that the stock of income generating capital (both human-made and natural) should be kept intact. The Fisherian definition of income on the other hand states that any durable producer or consumer goods manufactured during the current year must be omitted from this year's income because it constitutes a current addition to the stock of human-made capital that is expected to yield a flow of welfare benefits (services/utility) in future years. Therefore only the services rendered (utility gained) in the current year from the consumption of non-durable goods and by the depreciation of previously accumulated durable goods can be counted as part of this year's income, thereby arriving at what Fisher (1906) termed "psychic" income. Lawn (2006:443) states that the subtraction of natural and human-made capital depreciation from this "psychic" income leads to net "psychic" income which Fisher (1906) regarded as a more complete measure of [sustainable] income. Sadoff (1992:18) notes that if one uses the foregoing criteria in evaluating GDP as an adequate measure of national income, then GDP is theoretically-neutral and does not correspond to either the Fisherian, or the Hicksian definition of income. Lawn (2005a:8) agrees with this notion and states that GDP does not only lack the adequate theoretical foundations to make it a credible economic measure but it

is also, generally, a poor measure of income and sustainability as required by both the Fisherian and Hicksian definitions of income.[12]

2.3 PERCIEVED BENEFITS OF SNA AND GDP

As mentioned before, proponents of the SNA framework usually assert that the main benefit of using the SNA is that it is a useful tool in measuring the behaviour of the economy, performing macroeconomic analysis, assisting in economic policy formulation and decision making and is also useful for conducting international comparisons. In the forthcoming section the arguments put forward by the UN (2003) and other supporters of the measure will be discussed.

An argument put forward by the UN (2003:8) is that national accounts data provide information covering both different types of economic activities and the different sectors of the economy. It mentions that it is possible to monitor the movements of major economic flows and that information is provided about certain key balancing items and ratios which can only be defined and measured within an accounting framework, for example, the budget surplus or deficit. National accounts also provide the background against which movements of short-term indicators, such as monthly indices of industrial production or of consumer or producer prices, can be interpreted and evaluated (UN, 2003:1).

Costanza *et al.,* (2009:8) agrees with the above points but, however, states that because GDP measures only monetary transactions related to the production of goods and services; it is based on an incomplete picture of the system within which the human economy operates. Costanza *et al.,* (2009:8) mentions that the economy draws benefits from natural, social, and human capital and that the quantity and quality of such capital, in turn, is affected by net investment from the economy. By measuring only marketed economic activity, GDP ignores changes in the natural, social, and human components of social development. Thus, GDP not only fails to measure key aspects of social development; in many ways, it encourages activities that might be detrimental to it. For example an increase in crime that causes an increase in the output of industries related to the provision of security services, diverts scarce capital from activities which could be used to augment future output by, for instance,

[12]These definitions will be discussed in more detail in Chapter 4 of the study.

enhancing human capital through increased education expenditure (Lawn, 2005a, b, Van den Bergh, 2009, Costanza *et al*., 2009).

Another argument in support of the SNA framework is that, the framework is a vital mechanism for recording information or data that can be used for international comparisons of the volumes of major aggregates, such as GDP or GDP per capita, and also for comparisons of structural statistics, such as ratios of investment, taxes or government expenditures to GDP. UN (2003:9) states that such comparisons are used by economists, journalists or other analysts to evaluate the performance of one economy against that of other similar economies and they are crucial in the formulation of socio-economic policy and decision making. Van den Bergh (2010:124) mentions, however, that international comparability is a necessary but not sufficient condition for assessing the usefulness of any indicator. Costanza *et al.*, (2009:8) also questions the usefulness of GDP as a comparison tool by stating that it is alarming that GDP can be used as a tool to compare different countries and states of economies when the measure itself is fundamentally flawed and thus the results and ensuing decisions based on this information will be inaccurate.

Schepelmann *et al.,* (2010:20) mention that a general argument that is put forward by proponents of GDP involves the notion that there is a strong correlation between GDP growth and components of basic welfare such as high literacy rates, better nutrition and health care and life expectancy. Van den Bergh (2010:122) mentions that it is difficult to deny that such positive correlations can be observed for a specific period of time. However, he mentions that empirical evidence from alternative aggregate welfare measures and individual happiness research indicates that the correlation ranges from close to zero to negative for many developed countries beyond a certain income level. As mentioned before, Max-Neef (1995) calls this phenomenon the "Threshold Hypothesis". Van den Bergh (2010:122) also mentions that he has not been able to find evidence that shows that the "Threshold Hypothesis" is a developed country phenomenon only and does not affect less developed ones.

There is also a general view that GDP growth is generally needed or sufficient for (close to) full employment. Van den Bergh (2010:123) states that the empirical evidence to support this view is weak. Saget (2000:633) mentions that the employment rate may depend on factors other than GDP growth alone. Examples of these factors would include the general level of

education of the population, job search time by employment seekers and the structure of the economy (i.e. the share of primary, secondary and tertiary employment in total employment).

2.4 PERCIEVED DEFECIENCIES OF SNA AND GDP

Numerous authors have discussed the deficiencies in the SNA/GDP framework in an economic, environmental and social perspective. These authors include Samuelson (1961), Nordhaus and Tobin (1972), Easterlin (1974) and Sen *et al*., (2009). The economic perspective will be discussed first.

The first major economic criticism of GDP is based on the construction of the measure. Van den Bergh (2010:128) notes that the use and calculation of the GDP (per capita) indicator is inconsistent with three principles of good book-keeping, the first being that, one should distinguish costs from benefits; the second is that one should correct for changes in stocks and supplies; and lastly one should use accurate measures for all social costs; private and external. Van den Bergh (2010:128) also alludes to the fact that whereas firms employ separate accounts for benefits and costs associated with the business, GDP on the other hand, conflates benefits and costs. Talberth, Cobb and Slattery (2006:2) state that GDP is merely a gross tally of products and services bought and sold, without distinctions between transactions that enhance well-being and those that are inimical to it. Instead of distinguishing costs from benefits, productive activities from destructive ones, or sustainable ones from unsustainable ones, GDP is constructed by simply assuming that every monetary transaction augments social development by definition. In this way, expenditures triggered by crime, accidents, toxic waste contamination, preventable natural disasters and corporate fraud count the same as socially productive investments in housing, education, healthcare, sanitation, or mass transportation. Lawn (2005a:7-8) also adds that for an economy to grow, the magnitude of any additions to the stock of human-made capital (wealth) must exceed the magnitude of any subtractions. Therefore, Lawn (2005a:7-8) mentions that only a balance sheet accounting approach can properly reveal whether a nation's economy has grown and by how much.

The second economic deficiency relates to the notion that the informal economy is unaccounted for in the GDP measure. Lawn (2005a:8) states that GDP only covers activities and transactions that have a market price and thus completely ignores informal transactions between people that occur outside the formal markets. Examples of these informal activities would include activities such as subsistence agriculture, voluntary work, household work, and

child care. Bos (2006) mentions that this issue is more prevalent in developing countries. Thus, the recorded GDP of these countries is understated. To put the importance of the informal market in perspective, Schneider and Enste (2002) performed a study of the 'shadow economy' on a sample of 84 countries for the period 1988-2000 and they reported that worldwide, the value added by the informal economy had reached up to 44% of GDP in developing nations, 30% in transition economies, and 16% in Organization for Economic Cooperation and Development (OECD) countries. Van den Bergh (2010:132) also mentions that since GDP does not recognize the value of all kinds of informal activities and services, public policy is often aimed at curtailing informal activities instead of encouraging it. In addition, Van den Bergh (2010:132) states that actual GDP growth often implies a transfer of existing informal activities (unpaid labour) to the formal market. Thus the benefits were already enjoyed but the market costs were not yet included in GDP.

Schepelmann *et al*., (2010:21) state that other economic criticisms of GDP measure emanate from the fact that it partially incorporates the impact of technology and human capital. Schepelmann *et al.,* (2010:21) also note that GDP only reflects the value of the end product. It excludes changes in technology and dynamics in capital accumulation. In addition, investment in education and health is mostly treated as consumption in GDP, rather than investment, thus its contribution to GDP is also understated.

Another major criticism of the GDP measure has always been its inability to take into account environmental pollution and resource depletion and sustainability. Haripriya (2011:3) mentions that GDP has always focused on goods and services that are bought and sold in markets and ignored the non-marketed services provided by natural assets. Costanza (2009:9) also mentions that a particular concern is that GDP measurement encourages the depletion of natural resources faster than they can renew themselves while the current economic activity degrades ecosystems, thereby reducing the vital services that these ecosystems provide. These services include providing biodiverse habitats, mitigating flooding from severe storms, filtration to improve water quality in rivers and lakes and the sequestration of carbon dioxide and manufacture of oxygen. All of these services are excluded from GDP.

A major social issue that is raised when criticising GDP is that GDP emphasises average income, thus, implicitly puts a higher weight on the expenditures of the wealthy rather than focusing on income development of the poor. This was also one of the main criticisms of

Stiglitz (2005:6), who noted that median income rather than GDP per capita was superior in measuring inequality given that individuals or families with low incomes benefit relatively more when income increases, because of the diminishing marginal utility of income. GDP per capita does not, however, distinguish between the expenditures of the poor on basic goods and of the rich on luxury and status goods. Costanza (2009:10) adds to this by pointing out that GDP conceals a growing disparity between the haves and have-nots. Talberth (2007:23) states that a highly unequal distribution of income can be detrimental to economic welfare by increasing crime, reducing worker productivity, and reducing investment, particularly fixed capital investment. Moreover, when growth is concentrated in the wealthiest income brackets, it counts less towards improving overall economic welfare because the social benefits of increases in conspicuous consumption by the wealthy are less beneficial than increases in spending by those least well-off.

Other socially-related criticisms worth mentioning here include crime, family breakdown and health issues. Schepelmann *et al.,* (2010:22) states that all forms of social breakdown that involve the input of additional police force to deal with crime, damages to property or lawyers who manage divorces, add to GDP as they involve monetary transactions at some point. In addition, changes in the health conditions of a society are only reflected in GDP insofar as they increase the costs of the health system. Therefore, costs to the health system that were due to positive contributions such as improved medical techniques and increased life-expectancy are not easily identifiable against costs to the system due to negative activities such inefficient medical practices and maladministration by hospital practitioners (Schepelmann *et al.*, 2010:22).

2.5 CONCLUSION

The aim of this chapter was to provide a background of the national accounts framework as a measure of economic performance and social development. Therefore the evolution of the System of National accounts (SNA) was discussed; including its most prominent component, GDP. Theoretical issues regarding the SNA and GDP were also described. It was found that the SNA related more to Keynesian economic theory rather than welfare economic theory. It was also found that the SNA framework and therefore GDP did not appear to conform to either the Fisherian or Hicksian definitions of income.

Perceived benefits and deficiencies of SNA framework and GDP were also discussed in the chapter. The main perceived benefits of the SNA framework that were found was that the framework was still regarded as a valuable economic tool in terms of capturing data on market activity and monetary transactions in the economy and that it belongs within an internationally standardized accounting framework, as such, it is a concept which is still widely recognized and used. However the main deficiencies of GDP were found to emanate from the notion that it does not distinguish between economic activities that improve social and economic development and those that impair it, furthermore it also omits the measurement of social, economic and environmental sustainability.

These deficiencies were thus some of the reasons why alternative objective measures were proposed. Therefore in the next chapter the alternative objective measures of economic performance and social development will be introduced and discussed.

CHAPTER THREE

ALTERNATIVE OBJECTIVE MEASURES OF ECONOMIC PERFORMANCE AND SOCIAL DEVELOPMENT

3.1 INTRODUCTION

This chapter contains a discussion of the alternative objective measures of economic performance and social development. The first alternative measure that will be discussed is the Index of Sustainable Economic Welfare (ISEW) and associated Genuine Progress Indicator (GPI). The second measure is the Genuine Savings (GS) and the third measure is the Human Development Index (HDI).

These measures have been proposed as alternative measures to SNA-related measures such as GDP and the satellite accounts in an attempt to overcome some (if not all) of the deficiencies of the SNA related measures that have been discussed. However, these alternative measures also present a new set of issues which will be covered in the chapter.

The above measures' theoretical underpinning and construction will be examined. An empirical review of each measure will also be provided. The remainder of the chapter is as follows: Section 3.2 examines the ISEW/GPI; Section 3.3 discusses the GS; Section 3.4 examines the HDI and Section 3.5 concludes the chapter.

3.2 INDEX OF SUSTAINABLE ECONOMIC WELFARE (ISEW) AND GENUINE PROGRESS INDICATOR (GPI)

The Index of Sustainable Economic Welfare (ISEW) and its variant-the Genuine Progress Indicator (GPI) is an adjusted economic indicator which attempts to incorporate costs and benefits not traditionally measured in monetary terms. It combines various economic, social and environmental issues into one analytic framework. Time series data are drawn typically from government statistics. Non-monetary statistics are converted to cash values based on unit costs obtained from government or academic sources (Jackson and McBride, 2007:1).

Amongst the earliest attempts to address the deficiencies of GDP as a measure of economic performance and social development was the Measure of Economic Welfare (MEW)

proposed by Nordhaus and Tobin (1972). The MEW attempted to adjust GDP to account for certain economic and social factors. Jackson and McBride (2007:2) mentions that the original MEW excluded environmental factors thus the results of the study revealed that the MEW increased consistently but the rate of change in the MEW was less than rate of change in GDP. Nordhaus and Tobin (1972) thus concluded that GDP growth was still a vital factor in increasing levels of economic welfare and could therefore be viewed as an important determinant of economic welfare. However, when Nordhaus (1992) included environmental factors in a revised version of the MEW, the results began to diverge substantially from the previous study. Jackson and McBride (2005:17) states that even though Nordhaus (1992) attributed this divergence to factors such as declining productivity growth and dwindling savings rather than to the unsustainable use of natural resources, it was clear from the Nordhaus (1992) study that making certain economic, social and environmental adjustments to the conventional GDP measure, revealed that GDP could not necessarily be regarded as a robust indicator of both economic and social welfare.

The ISEW which is widely regarded as a revised and modern version of the MEW was introduced by Daly and Cobb (1989) and later revised by Cobb and Cobb (1994). The ISEW and associated GPI both use the same personal consumption data as GDP but deduct income inequality and costs of crime, environmental degradation, and loss of leisure and alternatively add the services from consumer durables and public infrastructure as well as the benefits of volunteering and housework. By differentiating between economic activity that diminishes both natural and human-made capital and activity that enhances such capital, the ISEW and its variants are designed to measure sustainable economic welfare rather than economic activity alone. In particular, if the ISEW is stable or increasing in a given year, stocks of natural and human-made capital on which all goods and services flows depend, will be at least as great for the next generation. On the other hand if the ISEW decreases, economic activities lead to the depletion of those stocks thereby restricting the next generation's prospects (Talberth *et al.,* 2006:3). Since the pioneering work of Daly and Cobb (1989) and Cobb and Cobb (1994), numerous ISEW's /GPI's have been produced for countries such as the USA, Thailand, Chile, Austria, Australia, Belgium, Italy, the UK, Wales, Scotland, Sweden and several English and Italian regions.

3.2.1 THEORETICAL AND CONSTRUCTION ISSUES CONCERNING THE ISEW AND GPI

In each of the different versions of the ISEW, the method has been tailored to suit specific national requirements or data sources. However, the fundamental method has remained fairly consistent. Jackson and McBride (2005:18) state that the basis for both the ISEW and GPI is consumer expenditure. Positive and negative adjustments are made to this basis to account for a series of social, economic and environmental factors. It is important to note that in the ISEW/GPI framework, it is assumed that personal consumption indicates to some extent the amount of money which consumers are willing to pay for (and hence the value they assign to) the goods and services through which welfare may be provided.

In the construction of the ISEW and GPI, total personal expenditure is first adjusted to account for inequality in the distribution of income in the economy. The second adjustment made to personal expenditure, is the subtraction of non-monetarised contributions to welfare from services provided by household labour. The third adjustment includes the subtraction of non-defensive expenditures such as private expenditures on health, car accident and personal pollution control. However, non-defensive expenditures such as the construction of public libraries and school buildings are added in the calculation of the ISEW and GPI. Another adjustment in the ISEW involves the subtraction of environmental costs arising from emissions including air and water pollution (Jackson and McBride, 2005:18).

Jackson and McBride (2005:18) state that several economic adjustments are also made to account for changes in the sustainability of the capital base. The first economic adjustment includes a 'net capital growth' adjustment to account for changes in the stock of human-made capital; it also includes the net transactions in overseas assets and liabilities in order to provide an indication of the sustainability of the economy in international terms. Another economic adjustment pertains to the inclusion of the difference between annual expenditure on consumer durables and the services flowing in each year from the stock of those goods. The final adjustment in the ISEW construction involves the subtraction of the depreciation of natural capital as a result of the depletion of natural resources, the loss of habitats and the accumulation of environmental damage from economic activity (Jackson and McBride, 2005:18). Therefore the ISEW/GPI is given by the following equation (Jackson *et al.*, 1997:19):

ISEW/GPI = PCE - II + NDPE + DL+ EA - DPE - ED – NCD**..... [EQ1]**

where: PCE = Personal Consumer Expenditure

II = Adjustment for Income Inequality

NDPE = Non-Defensive Public Expenditures

DL = Value of Domestic Labour

EA = Economic Adjustments

DPE = Defensive Private Expenditures

ED = Costs of Environmental Degradation

NCD = Depreciation of Natural Capital

Talberth *et al.,* (2006:3) state that the ISEW's theoretical foundations can be found in both the above construction and what the index is attempting to measure. Talberth *et al.,* (2006:3) state that the ISEW falls within the realms of two theoretical concepts of sustainable development. These are Hicksian and Fisherian definitions of income. Talberth *et al.,* (2006:4) states that measures based on Hicksian income deduct from GDP, depreciation of both human-made and natural capital stocks. However, measures based on Fisherian income measure net "psychic" income, which deducts the harmful aspects of consumption from its welfare (utility) enhancing aspects.

Although the ISEW has components that are used for calculating both Fisherian or Hicksian income, in aggregate, Talberth *et al.,* (2006:4) state that the ISEW is more consistent with the Fisherian notion of income because it attempts to measure the net "psychic" income households derive from their consumption activities. Lawn (2003:106) agrees with this notion and states that the ISEW measures the "welfare (utility) a nation enjoys at a particular point in time given the impact of past and present activities" and this can be confirmed by comparing the ISEWs construction method and components with the Fisherian concept of income.

The issue of Sustainable Development (SD) has also been widely debated and the consensus is that sustainable development requires a non-declining level of well-being for future generations. Even though there is no definite definition of SD, there have been principles of

sustainability that have been put forward. Talberth *et al.,* (2006:4) mentions that sustainability principles are typically grouped into three core domains of economic, environmental, and social sustainability. In addition, a key meta- principle of sustainability is that social, environmental and economic needs must be met together for sustainable outcomes to occur in the long term. Talberth *et al.,* (2006:4) mention that this key principle is embodied in the ISEW since it tracks progress in each domain and recognizes the interdependence of economic well-being with the quality of the natural environment and the quality of social relationships. Talberth *et al.,* (2006:5) mentions that this could be confirmed by going through the ISEW's components, for example the ISEW's economic domain is populated by personal consumption expenditures, consumer durable service flows, services from public infrastructure, net capital investment, and net foreign borrowing. The environmental domain assigns costs to air, noise, and water pollution, lost farmland, wetlands, and forests, depletion of oil reserves, as well as carbon dioxide and damage to the ozone layer. The social domain counts the benefits of volunteer work, higher education, and parenting as well as the costs of crime, inequity, commuting, and vehicle accidents. Talberth *et al.,* (2006:5-7) therefore, concludes that it can be argued that the ISEW is also consistent with the SD theory.

Despite the arguments put forward by proponents of the ISEW/GPI, the measure is not without its critics. The majority of criticisms that have been levelled against the ISEW/GPI have usually revolved around its theoretical foundations and its construction. Dietz and Neumayer (2006:189) argue that it is not possible to combine an indicator of current welfare with an indicator of sustainability because the costs associated with the depletion of non-renewable resources and other forms of natural capital incurred by future generations barely affect current welfare. Deductions for natural capital depletion, then, are inconsistent with the Fisherian notion of income that the GPI purports to measure. However, Lawn (2003:112) maintains that because Fisher's (1906) concept of income and capital treat the production of replacement goods as the cost of keeping human-made capital intact, it is appropriate to deduct natural capital depletion costs. On the same note, Talberth *et al.,* (2006:7) mention that another theoretical flaw is the fact that while the GPI purports to be based on the principle of *strong* sustainability, it in fact measures *weak* sustainability. This is because the GPI measures the loss of both natural and human-made capital separately. Thus, if natural capital is depleted, the costs of this can be covered by the substitution of human-made capital of equal or greater value. Therefore, theoretically, the ISEW measures *weak* sustainability at

best, because it is constructed by assuming perfect substitutability among different forms of capital. Thus, it diverges from the Fisherian notion of income. However, Lawn (2008:63) disagrees with this assertion and states that in the ISEW measure, the components are treated as compliments rather than perfect substitutes.

Talberth *et al.,* (2006:7) also mentions that in terms of GPI/ISEW construction, the most important critique of the measure is that there is considerable subjectivity in deciding which factors should be included or excluded from the index. For example, Neumayer (1999:82-85) mentions that the GPI corrects for income inequality but omits corrections for the degree of political freedom or degree of equality between genders and it also fails to take an adequate account of changes in human capital, which if included might radically change the composition of the index. Talberth *et al.,* (2006:7) states that because the GPI framework requires a subjective judgment of what affects welfare and what comprises defensive expenditure, it cannot serve its desired role as an objective measure of sustainable economic welfare. Lawn (2005b:199) also mentions that the lack of appropriate data for many GPI components has led to the need to estimate the values of the items that may be, at best, distant approximations of their correct value and therefore results obtained using these values are also unlikely to be accurate.

Responses to these criticisms have been put forward by some authors (see, for example, Lawn (2003; 2005; 2006). However, Jackson and McBride (2005:37) state that the problem of subjectivity in the selection of components is the hardest to address. This is because there is no clear consensus on what should be included in such indices, of which, Jackson and McBride (2005:37) blame on the lack of a consistent conceptual framework on which authors can base their studies. Jackson and McBride (2005:37) therefore mention that improving on the consistency and composition of the ISEW and similar measures probably requires building the kind of international effort that characterised the early development of the SNA.

3.2.2 EMPIRICAL LITERATURE CONCERNING THE ISEW/GPI

Jackson and McBride (2005:23) state that despite the inconsistency in the ISEW/GPI method in the different studies there are three critical decisions in the ISEW method that each of the different studies had to choose. These are, firstly what method to use for calculating the

welfare loss associated with income inequality, secondly whether to use annual or cumulative carbon emissions as the basis for accounting for the costs of long-term environmental damage and lastly which method to use for calculating resource depletion. Therefore, in discussing the different studies, there will be an attempt to briefly describe the different methods chosen by the authors.

As mentioned before, the ISEW/GPI has been constructed and applied in various countries and the first of these studies was performed by Daly and Cobb (1989), later revised by Cobb and Cobb (1994), in the United States for the period 1950-1990[13]. In calculating the welfare loss associated with income equality the original Daly and Cobb (1989) used a Gini coefficient indexed to the base year (1950) to adjust personal consumption while the revised version of Cobb and Cobb (1994) used an index based share of income received by the bottom quintile of the population. In terms for accounting for the costs of long-term environmental damage the original Daly and Cobb (1989) and Cobb and Cobb (1994) argued that the damage costs associated with climate change should be allowed to accumulate throughout the period of the study. Finally in terms of which method to use for calculating resource depletion the original Daly and Cobb (1989) simply subtracted the entire value of resource extraction in each year, while Cobb and Cobb (1994) used a replacement cost method which estimated the costs of replacing all fossil fuel consumed in a given year with renewable energy. The results of applying this method to the United States revealed a trend in sustainable economic welfare which differed from the trend in GDP during the period examined (1950-1990). While GDP in the United States increased substantially during the period, the ISEW began to level out, and even decline slightly from about the mid-1970s onwards.

A GPI study by Venetoulis and Cobb (2004) for the period 1950 to 2002 was also published for the USA. In the study, personal consumption was weighted for income inequality using the Gini coefficient; the costs of climate change were counted cumulatively, while the depletion of natural resources used the replacement cost method used in Cobb and Cobb (1994). This GPI incorporated accounts for social costs such as crime, divorce and loss of

[13]It is important to note that subsequent studies have not been consistent in following the US revisions. Some have more or less followed the Daly and Cobb (1989) or Cobb and Cobb (1994) method, others, however have made specific revisions to that method. In a number of cases, poor data quality has led to the omission of key columns. In other cases, additions have been made on the basis of local priorities.

leisure time. It also included the value of volunteer work. The results of the study revealed that the GPI increased in line with GDP until the mid-1970s. From the high point in 1976 they then declined steadily until a slight recovery in the late 1990s. Although GDP tripled during the period, GPI increased by only two thirds over the 1950-2002 period. Talberth *et al.,* (2006) also studied GPI using USA data for the period 1950-2004, while Beca and Santos (2010) studied the period 1950-2005. The results of the Talberth *et al.,* (2006) ISEW were similar to the previous USA studies with only minor differences in the methods employed by the authors. However, the Beca and Santos (2010) study differed from the previous USA studies in terms of the method used for accounting for the costs of long-term environmental damage. Instead of using a cumulative approach, Beca and Santos (2010) chose to calculate costs from climate change using annual flows from carbon emissions and other ozone depleting substances emissions. Beca and Santos (2010:816) state that the cumulative approach chosen by other studies leads to multiple counting thereby diminishing the ISEW's values beyond a threshold point, hence, driving the index into negative values[14]. However, the annual flow method used in their study avoids this problem and the ISEW does not show a significant decline in the latter years of the study. Beca and Santos (2010:816) also mention that their ISEW, generally, has lower values across the entire period, when compared to the earlier versions of the ISEW, because they include additional social components, such as the cost of crime, costs of underemployment, and the environmental components which have higher marginal costs.

In addition to the national GPI's/ISEW'S, attempts have been made to construct GPIs/ISEW's for individual states or localities in the USA and elsewhere. Jackson and McBride (2005:34) state that these regional studies are often reliant on wider national proxies for regional data but are nonetheless useful in highlighting regional variations in economic welfare, and also in exploring the boundaries of the method. Some of the regional US studies include the Costanza *et al.,* (2004) study that calculated the GPI for the Vermont State, Chittenden County and the City of Burlington for the period 1950-2000. The method applied to the Costanza *et al.,* (2004) study was quite similar to previous US studies and it did not come as a surprise when the results of these indices echoed the growing divergence between GDP and GPI over a period of time. However, Costanza *et al.,* (2004:145) found that the Vermont States' GPI remained closer to GDP and this was attributed to the high proportion of

[14]Beca and Santos (2010:816) state that this is evidence that the ISEW tapering off at later years is due to the method chosen rather than the "Threshold Hypothesis" effect.

environmentally friendly non-fossil fuel used in the region. Another US regional study was performed by Bagstad and Shammin (2009) for State of Ohio, cities of Akron and Cleveland, and 17 Northeast Ohio counties for the period 1950-2005. The authors also made inter (Ohio versus Vermont) and intra-regional (urban-suburban-rural) comparisons. Bagstad and Shammin (2009:8) found that per capita GPI increased in eight counties but declined for nine counties, including Ohio, Akron and Cleveland. Per capita GPI was found to be greatest in suburban counties and lowest in urban areas, and was greater in Vermont than Ohio. Bagstad and Shammin (2009:8-10) state that these trends were largely driven by gains in personal consumption relative to rising environmental, social, and economic costs. These costs included income inequality, climate change, non-renewable resource depletion, and consumer durables.

An ISEW was constructed for the Netherlands by Rosenberg and Oegema (1996) for the period 1950 to 1992. The Netherlands index was based mainly on the Daly and Cobb (1989) study. With respect to the method, the income inequality adjustment was made using a base year Gini-type index to adjust consumption, climate costs were counted cumulatively; and resource depletion was accounted for by subtracting the value of fossil fuels used in each year as in the original Daly and Cobb (1989) ISEW. The results showed that the ISEW climbed faster than GDP over the first three decades of the study period, but declined quite sharply in the early 1980's. This result is unusual in comparison with most other studies, since the ISEW was above GDP at most stages of the period in question. Jackson and McBride (2005:66) mention that this unusual pattern could be explained by the study's exclusion of variables such as domestic labour, the service flow from consumer durables and net capital growth, due to lack of data.

Jackson and Stymne (1996) constructed a Swedish ISEW for the period 1950-1992. The authors broadly followed the revised Cobb and Cobb (1994) methodology throughout. Firstly, the income inequality adjustment was made using the Gini coefficient, secondly, the costs of climate change were accumulated and lastly the depletion costs were calculated using the replacement cost method. By contrast with some other countries, the Swedish ISEW followed GDP much more closely until the early 1980s. It then began to depart from GDP per capita over the last decade of the study. Jackson and Stymne (1996:46) state that the reason for the slightly better performance of ISEW over much of the period can be attributed mainly to the fact that the Swedish electricity system had a high proportion of hydro-generation.

Fossil fuel consumption, resource depletion costs, and climate change costs were, therefore, all significantly lower in Sweden than for other countries. In addition, the authors state that Sweden's social policy had a positive redistributive effect and thus resulted in reduced income inequality. However Jackson and Stymne (1996:46) state that in spite of these moderating factors, there was a significant variation between GDP and ISEW per capita by the end of the period.

Jackson, Laing and McGillivray (1997) undertook an ISEW study for the United Kingdom for the period 1950-1996. The study also closely followed Cobb and Cobb (1994) study. The study used the Atkinson index to calculate the welfare losses from income inequality, long-term environmental damage was accounted for in a cumulative basis, in relation to resource depletion the study followed the replacement cost method used in Cobb and Cobb (1994) but they used a lower cost escalator. In addition, crime and family breakdown columns were also added. The results of the UK ISEW exhibited a common trend to other studies, rising more or less in line with GDP until the mid-1970s and then diverging from the GDP trend.

An Austrian ISEW was developed by Stockhammer *et al.*, (1997) for the period 1955-1992. This study was also largely based on the USA ISEW studies. The study used a Gini like measure indexed to the base year. In relation to resource depletion, Stockhammer *et al.*, (1997) utilised the method used in Daly and Cobb (1989) and the costs of climate change are based on cumulative emissions. The results of the Austrian ISEW are very similar to previous ISEW studies. The ISEW follows GDP for the early years of the study, but begins to diverge significantly from the late 1970s onwards. Stockhammer *et al.*, (1997:19) however, suggest that this divergence was due to welfare reductions, increasing income inequality and the stagnation of unpaid household labour.

Hanley, Moffat, Faichney and Wilson (1999) computed an ISEW and GPI for Scotland for the period 1980-1993. The methods employed for both the ISEW and GPI were largely based on the original Daly and Cobb (1989). The results of the study revealed that whilst GDP was increasing over the period, both of the the ISEW and GPI were decreasing, however, not as sharply as other studies. Hanley *et al.*, (1999:64) mention that for Scotland, the most important influence on the pattern of both ISEW and GPI was the deterioration in the distribution of income, as reflected in the Gini-coefficient. The depletion of non-renewable resources, loss of wetlands, increases in commuting costs, increasing defensive expenditures

for health reasons and long-term environmental damage (measured as the costs of carbon dioxide emissions) also contributed to a falling ISEW and GPI. Therefore, the authors concluded that development in Scotland became less sustainable over the period in question.

Guenno and Tiezzi (1998) constructed an ISEW for Italy for the period 1960 to 1990. The study also followed the Daly and Cobb (1989) ISEW method fairly closely. The income inequality adjustment was made by constructing a composite 'index of inequality' for Italy using a variety of local indicators including a Gini-type coefficient. Long-term impacts from climate change was accounted for on a cumulative basis; however the Guenno and Tiezzi (1998) study departed from the previous studies in its calculation of the cost of resource depletion by choosing to use the El Serafy user cost method[15]. The results of the study show that the ISEW grew more slowly over most of the period and as a result there was a growing gap between ISEW and GDP. However, this study is uncharacteristic because there was no clear turning point at which the ISEW began to stabilise or decline. On the contrary the index grew consistently over the period, although at a slower rate than GDP. Jackson and McBride (2005:28) attributed this ISEW trend to the study's lack of sufficient data. A regional ISEW study for Italy was also performed by Pulselli, Bravi and Tiezzi (2011) for Tuscany for the period 1971-2006. It was found that the ISEW showed a similar trend to the national ISEW, however, the Tuscany ISEW did increase at a substantially slower rate than the national ISEW.

Hamilton (1999) constructed a GPI for Australia for the period 1950 to 1996 based closely on the Daly and Cobb (1989) study. With respect to the method, Hamilton (1999) calculated income distribution by weighting personal consumer expenditure on the basis of an index of the share of total income in the lowest quintile as in the Daly and Cobb (1989) ISEW, the long-term damage from climate change was calculated using annual carbon emissions (as in the Beca and Santos (2010) method) and the costs of depleting natural resource used the same replacement cost method as in the revised Cobb and Cobb (1994) ISEW. Hamilton (1999) also augmented the value of household labour with the value of community work and also attempted to account for the psychological costs of unemployment and underemployment. The study found that from the 1950's there was a steady rise in both GDP and GPI, however,

[15]The El Serafy (1989) method assigns a value to the "user cost" of resource extraction. It indicates the share of the resource receipts that should be considered as capital depreciation (Neumayer, 2004).

the GPI started to decrease from the late 1970's onwards while GDP continued to rise. Hamilton (1999:26) state that the decline in the GPI since the late 1970s would have started sooner except for the impact of a substantial measured improvement in income distribution in the early 1970s. Thus the measured improvement in income distribution in the 1970s masked the divergence of the GPI from GDP that began in the late 1970s. Hamilton (1999:26) state that the improving trend in the GPI in the 1970s was reversed at the end of the decade, and the result was a sharp divergence between GDP and the GPI. Hamilton (1999:26) mention that the principal factors explaining the divergence since the late 1970s were unsustainable levels of foreign debt, the growing costs of unemployment and overwork, the combined impact of a number of environmental problems including greenhouse gas emissions, the escalating costs of energy resource depletion and a failure to maintain investments in the national capital stock. Therefore, contrary to Beca and Santos (2010), Hamilton (1999) concluded that the results suggest that for the last two decades (1980s and 1990s) of the study, the benefits of economic growth to the Australian society were offset by the costs, thus confirming the "Threshold Hypothesis".

Castaneda (1999) constructed an ISEW for Chile for the period 1965-1995 which was the first ISEW/GPI measure constructed for a less developed economy. In the study income inequality was factored in using the Gini coefficient indexed to the base year, the costs associated with climate change were accounted on a cumulative basis and the resource depletion costs were calculated using a Hotelling rent method. However due to insufficient data, columns to account for the loss of wetlands, costs of ozone layer depletion and net international position were all omitted from the study. The results that were found were interesting because they were very similar to the results from studies in more developed economies. It was found that the Chilean ISEW followed GDP relatively closely and then began to depart from GDP during the 1980s in much the same way as had been observed in the more developed economies.

Matthews, Munday, Roberts, Williams, Christie and Midmore (2003) constructed an ISEW for Wales for the period 1990-2000. The study also drew substantially from the original Daly and Cobb (1989) method. Matthews *et al.,* (2003:39) mention that the gap between GDP per capita and ISEW per capita increased during the study period. The main contributors in the ISEW decrease between 1990 and 2000 were the services from consumer durables adjustment, adjusted consumption, non-renewables and long term environmental change.

However, Matthews *et al.,* (2003:39) mention that the cost associated with overall pollution fell during the period.

Clarke and Islam (2005) constructed an ISEW for Thailand for the 1975-1999 period. It is worth mentioning that this study was the second ISEW study to be performed on a developing country. The study also closely followed the Daly and Cobb (1989) and Cobb and Cobb (1994) method. Income inequality was calculated using the Atkinson index, carbon emissions were calculated on an annual flow basis. Emissions from deforestation and rice cultivation and fossil fuel consumption were also calculated on an annual flow basis. Resource depletion was not accounted for in the study. Clarke and Islam (2005) also made some adjustments which were specific to the Thai case. For example they subtracted costs of corruption, commercial sex work and servicing debt. The results of the study revealed that the ISEW per capita rose more slowly overall but during the Asian financial market crises (1996-1998) both the GDP and ISEW declined. However, during the economic recovery period (1998 onwards), GDP began to rise while the ISEW failed to recover. Clarke and Islam (2005:88) state that it was too early to confirm whether this was a trend or a fluctuation. However, drawing on the results of other studies, they concluded that a continuing divergence could be expected. Clarke and Islam (2005:88) also mention that the most significant negative adjustment in the ISEW was the cost of inequality to welfare. The authors mention that the inequality cost was eight times more than the estimated costs of commercial sex work. However, the largest positive adjustment in the ISEW was education.

An ISEW was constructed for Poland by Prochowicz and Sleszynski (2006) for the period 1990-2003. The authors chose to follow a similar method to Daly and Cobb (1989) and Stockhammer *et al.,* (1997).The results of the study did not differ much to other studies, however, the ISEW did not diverge significantly from the GDP trend. Prochowicz and Sleszynski (2006:85) also observed that the lowest values of ISEW were observed in 1990, when Polands's economy contracted. The ISEW increased after 1990, until 1992. During the 1992 to 2000 period, the ISEW decreased. However, it stagnated after 2000. Prochowicz and Sleszynski (2006:85) attributed this decrease and subsequent stagnation of the ISEW to losses caused by commuting and road accidents, long-term environmental damage, expenditures on consumer durables, losses due to ozone layer depletion, change in net international position and the depletion of non-renewable resources. In addition, Prochowicz and Sleszynski

(2006:85) state that growing welfare inequalities in Poland penalized the value of ISEW more significantly than the other factors.

Bleys (2008) revised and updated an earlier version of an ISEW study by Bleys (2006) for Belgium for the period 1970-2004. The Bleys (2006) method was based on the Daly and Cobb (1989) and Cobb and Cobb (1994) study. Bleys (2008) found that the Belgian ISEW followed a similar trend to the rest of the other studies. However, the Bleys (2008) adjusted the ISEW method by omitting the 'net capital growth' and 'change in net international investment position' items. Bleys (2008:746) argued that these items do not comply with the theoretical foundation underpinning the ISEW. The study also excluded the escalation factor in the valuation of natural capital depletion. Long-term environmental damage was valued using a stock-based approach and additional government expenditures were considered to be non-defensive. Bleys (2008:749) found that these changes in the revised ISEW led to significant improvements in the ISEW over the entire study period, even though it was still lower than GDP.

Nourry (2008) developed an ISEW and GPI for France for the period 1990-2002. Nourry (2008:447) mentions that the method and components chosen were based on the other European ISEW studies. The results showed that ISEW and GPI per capita had lower values than GDP per capita for the entire period. Nourry (2008:447) also note that, over the whole period, GPI per capita was inferior to ISEW per capita, this trend was attributed to the additional social, political and environmental variables included in the GPI. It was found that two distinct trends appeared for the indices. The first trend was from 1990 to 1997 and a second one from 1997 to 2002. During the first period, the ISEW and GPI per capita increased steadily, as did GDP per capita, suggesting that the development of France improved during the period. However, during the second period, the trends were no longer similar. While GDP per capita continued to increase, ISEW and GPI per capita declined. Nourry (2008:447) states that this was mainly due to significant changes in the net investment position and net capital growth.

Many reasons have been put forward regarding the reasons for the eventual divergence of the ISEW/GPI and GDP over time as found by various authors. The causes of such divergence include greater inequality in the distribution of incomes over the later years of the studies, and the steady accumulation of resource depletion and long-term environmental damage. This

divergence between GDP and ISEW/GPI seems to confirm the 'Threshold Hypothesis' put forward by Max-Neef (1995). As mentioned in Chapter One, the "Threshold Hypothesis" states that for every society there seems to be a period in which economic growth (as measured by GNP/GDP growth) brings about an improvement in the quality of life, but only up to a point (the threshold point) beyond which, if there is more economic growth, quality of life may begin to deteriorate (Max-Neef, 1995:117) Jackson and McBride (2005:36) mention that if this hypothesis is even partially correct, then it clearly poses some important challenges for conventional economic and social policy. In particular, it contradicts conventional economic theory that economic growth inevitably leads to improved overall social development, and raises some serious doubts about the assumption that the best way of improving and maintaining quality of life is to pursue policies that will raise a nation's GDP.

Authors such as Bleys (2008), Beca and Santos (2010) and Neumayer (1999) have, however, criticized the "Threshold Hypothesis". Neumayer (1999:82-85) has suggested that the threshold hypothesis is only valid when certain components and methods are used to construct it. This is supported by studies such as Beca and Santos (2010:816) who after applying a different method in accounting for climate change costs in the ISEW calculation, did not find any evidence of the "Threshold Hypothesis". Even Nourry (2008:448) mentions that the trends of ISEW and GPI per capita in his study do not support the "Threshold Hypothesis" for France between 1990 and 2002, contrary to other studies on European countries. However, Nourry (2008:448) states that these other authors computed ISEW or GPI per capita during a longer period and therefore, an extension of the study period for France may confirm the "Threshold Hypothesis". Authors such as Lawn (2003) have, however, explicitly supported the "Threshold Hypothesis" while others have implicitly confirmed the validity of the hypothesis in their studies results (see Castaneda (1999), Hamilton (1999) and Hanley *et al.,* (1999)).

3.3 ADJUSTED NET SAVINGS/GENUINE SAVINGS (GS)

The Genuine Savings (GS) measure was developed by Pearce and Atkinson (1993) and revised by Hamilton *et al.,* (1997)[16]. Schepelmann *et al.,* (2010:28) mention that the GS

[16] As mentioned before, this measure was later adopted by the World Bank (1997).

measures net investment in produced, natural and human-made capital. The GS achieves this task by recalculating national savings figures by accounting for depreciation of human-made capital, depletion of natural resources, the value of environmental pollution and investments in human capital. Boringer and Jochem (2008:5) mention that as in the ISEW, all the values in the GS measure are monetarized, such that aggregation is again achieved by simply adding up the figures.

Hanley *et al.,* (1999:58) mentions that the GS measure is based on the "Hartwick Rule". As mentioned before, the "Hartwick Rule" requires that rents from natural resource extraction be re-invested in human-made capital to keep the total amount of capital (natural plus human-made) from declining. The measure tests whether a country follows the "Hartwick Rule" by comparing the national savings rate with the sum of depreciation on natural and human-made capital, all expressed as a fraction of national income. Pearce and Atkinson (1993:103-106) argue that if all savings are re-invested in these two forms of capital then the aggregate capital stock will not decline, and a constant consumption stream can be maintained, which the authors take to be synonymous with sustainable development. Lin and Hope (2004:3) concur with Pearce and Atkinson (1993) by stating that, by definition, the GS can be useful in measuring sustainable development, since it monitors the stock of capital that will be available for future generations in a country. Thus, persistent positive GS values indicate a sustainable development path while persistently negative GS values indicate an unsustainable one. Neumayer (2001:112) states that negative GS rates in one year do not necessarily imply unsustainability. Only if these rates are 'persistently' negative can unsustainability be inferred. Lin and Hope (2004:3-4) mention that a major advantage of the GS measure is that it presents resource and environmental issues in a manner that could easily be understood by policy-makers therefore serious policy questions that are key to sustainable development could be brought to the fore.

3.3.1 THEORETICAL AND CONSTRUCTION ISSUES CONCERNING GS

Nourry (2008:444) states that Genuine Savings (GS) stems from a theoretical model of maximization of a social welfare function, discounted at a constant rate, under the hypothesis of constant population and perfect substitution between all kinds of capital and within this framework, it can be shown that the economy is unsustainable if its GS is negative. Lin and

Hope (2004:3) mention that the GS is given by the following World Bank (1997) operational specification

GS = GNS − FCC + EE − NRD −DP**..... [EQ 2]**

where: GNS = Gross National Savings

FCC = Fixed Capital Consumption

EE = Education Expenditures

NRD = Value of Natural Resource Depletion

DP = Value of Damage caused by Pollutants (carbon dioxide (CO_2) and Particulate Matter (PM_{10})

As mentioned before, GS is an extension of the "Hartwick Rule", and according to the rule an economy is sustainable if savings are greater than the aggregated depreciation of human-made and natural capital. However, Asheim, Buchholz and Withagen (2003) and Pezzey and Toman (2002) have shed doubt on the **"**Hartwick Rule" being used as a measure of sustainability. The authors argue that not all external effects are internalized in the GS measure and thus resource productivity is not represented appropriately in the measure.

Nourry (2008:444) mentions that GS is a measure of *weak* sustainability, which is based on perfect substitutability between different types of capital including natural and human-made capital. By contrast, *strong* sustainability assumes non substitutability between the different types of capital but yet still requires both natural and human–made capital to be kept intact over time such that the overall integrity of the ecosystem is sustained. In connection with *weak* versus *strong* sustainability, Pearce (2000:23) notes that the domain over which substitution takes place should be considered. Even in the *weak* version, substitution in an economic sense means substitution at the margin and not total substitution, as most ecological and life-supporting services of natural resources are simply not substitutable. Pillarissetti (2005:600) also adds that if environmental limits have been exceeded, *weak* sustainability is not achievable. Pillarissetti (2005:600) states that considering a much larger set of natural assets, have shown that production in the world exceeds the Earth's carrying capacity resulting in an ecological overshoot. In addition, Pillarissetti (2005:600) mentions that there is a majority-held view that at the global level, all economies together are operating

beyond the ecological footprint determined by the Earth's capacity and therefore under the assumption of ecological overshoot, *weak* sustainability should therefore no longer be relied upon as the criterion.

Nourry (2008:444) also mentions that problems with the measure appear during the switch from the theoretical GS definition to the operational one. Firstly, the theoretical model supposes that the economy follows an efficient growth path. Therefore, prices used in the GS computation must be optimal and sustainable prices. However, only current prices are available for empirical work and these prices are neither optimal nor sustainable. Nourry (2008:444) concludes by stating that, since empirical values of GS are estimated with incorrect data, conclusions on national sustainability based on this indicator should be used carefully. Secondly, Nourry (2008:444) states that the choice of method to compute natural resource depletion and environmental damage is crucial since it can substantially alter the results of the study. For example, Neumayer (2000) used the El Serafy method (e.g. instead of replacement cost method) to assess resource depletion and this choice of method altered the value of GS for countries with substantial oil reserves (i.e.GS rates changed from a negative to a positive) thus transforming conclusions on the sustainability of those countries. Nourry (2008:444) also adds that GS is overestimated because only damage from Carbon dioxide (CO_2) and Particulate matter (PM_{10}) are subtracted; therefore, other environmental factors such as biodiversity, water and soil are not included, although these factors are important in assessing national sustainability. Hanley *et al.*, (1999:59) also mention that *weak* sustainability in the context of the GS is a very narrow conception of what sustainability means, for example, the measure ignores attention to intra-generational fairness in the distribution of income, unlike other alternative objective measures.

3.3.2 EMPIRICAL LITERATURE CONCERNING GS

In their pioneering work, Pearce and Atkinson (1993) derived the GS for 18 countries with 1981 data. They found that out of the 18 countries considered the developed countries such as West Germany, Netherlands, Japan and the USA all had positive GS values and thus were sustainable in their development. Less developed countries, such as Burkina Faso, Madagascar and Nigeria had negative values. Some countries like Mexico and the Philippines were also found to be marginally sustainable due to their relatively high savings ratio.

Bekerman (1994:203) states that these results confirm the argument that the GS measure is implicitly bias in favour of high income countries which would obviously have high savings ratios.

Hamilton and Clemens (1999) also performed a GS study for developing regions of the world for the period 1970-1993. They found that the GS rates for the Sub-Saharan Africa (SSA) countries were the worst out of all the regions. Hamilton and Clemens (1999:12) mention that the results revealed that the SSA regions' average GS values failed to exceed five percent of GNP during the 1970's, afterwards the values became negative, a trend which lasted throughout the rest of the period. Hamilton and Clemens (1999:12) also mention that what aggravated the situation for SSA was that the negative GS rates for the period were also accompanied by persistently low regional indicators of human welfare, including education, nutrition, and medical care.

Hamilton and Clemens (1999:12) also mention that the oil crisis of 1982 coincided with a period of decline in GS throughout Latin America and the Caribbean, whereby the regional GS values dropped to negative five percent. Hamilton and Clemens (1999:12) also state that when the region improved democratic processes, recovered from the debt crisis, and experienced strong growth, the GS rates also showed a consistently positive trend, even though they remained well below five percent of GNP (from 1985, onwards). In contrast to aforementioned regions, the East Asia/Pacific region, experienced positive GS rates for the period, averaging fifteen percent of GNP. Hamilton and Clemens (1999:12) do however, concede that the effects of important local pollutants within the East Asia/Pacific region, such as particulate matter (PM_{10}) in the air, were excluded in their calculation, therefore this might have contributed to the positive results obtained for this region.

Hamilton and Clemens (1999:13) also found consistently negative GS values for the Middle East/North Africa region during the period. Hamilton and Clemens (1999:13) state that as the most resource-dependent economies, these countries exhibited the highest downward bias in estimated GS rates. South Asia exhibited moderately positive rates of GS over the period. Hamilton and Clemens (1999:13) mention that this is consistent with the moderate economic growth rates that characterized the countries in the region for the period. Finally, it was found that GS rates in the high-income OECD countries' were near ten percent for much of the period in question. Hamilton and Clemens (1999:13) states that the OECD countries' GS

values were pushed upward by high investment, lack of dependence on natural resources, and strong exports of high value added goods and services.

The World Bank (2004) studied the GS in 140 countries for the period 1980-2000, and confirmed the results of Hamilton and Clemens (1999). Empirical results showed that GS values for OECD countries as well as East and South Asian countries were positive during the period 1980–2000, whereas many African and Middle Eastern countries GS values were negative. Schepelmann *et al.,* (2010) also observed that these countries became impoverished progressively and were dependent on natural resources exploitation. Thus, the governments of these nations did not invest the proceeds from the sale of natural resources in economic and social infrastructure, which contributes to greater GS values. As mentioned, GS values have been greater in the South/East Asia/Pacific region, which during the last half-century, have benefitted from substantial government investment on economic and social infrastructure.

Hanley *et al.,* (1999) computed a GS for Scotland for the period 1980-1994. The method employed by Hanley *et al.,* (1999) is similar to the World Bank (1997) specification; however, the authors chose to separate the GS into two sections. The first includes the discoveries of offshore hydrocarbons (which are eco-friendly) and the second does not. It was found that in both cases the overall pattern shows that Scotland, over the period, was largely unsustainable, in that insufficient funds were being re-invested in the economy to cancel out depreciation of human-made and natural capital. Hanley *et al.*, (1999:63) state that on the whole, this negative value for GS may be due to historically low levels of saving (not GS) and oil price volatility.

During the period 1985–1993, however, there was an upward trend. Hanley *et al.,* (1999:63) mention that this upward trend could be due in part to increasing levels of savings , and in part to decreasing oil prices in Scotland. Hanley *et al .,* (1999:63) add that *ceteris paribus*, the lower are oil prices, the higher was the GS measure for Scotland, *vice versa*. Hanley *et al.,* (1999:63) also revealed that that the GS index was positive during the years when hydro-carbons were discovered (1986 and 1993).

Dosmagambet (2009) computed a GS for Kazakhstan for the period 2005-2007. The results of the study confirmed Hanley *et al.*, (1999:63) observation that *ceteris parabis* the higher the oil price the lower the GS. However, the Dosmagambet (2009) study went a step further and

showed that the majority of oil producing countries (including Kazakhstan) had significantly lower GS compared to non-oil producing countries in the period. Atkinson and Hamilton (2003:1804) mention that countries with an abundance of natural resources should theoretically benefit from their resources, however, it is usually found that these benefits are not realised and the resource abundance leads to negative development and economic growth (i.e. Resource Curse Hypothesis). Atkinson and Hamilton (2003:1804) discovered that there is a strong correlation between countries that have contended with the 'resource curse' and negative GS. Sato and Samaret (2008) also found that, not only were negative GS values prevalent in resource abundant countries but were also prevalent in low income countries.

Nourry (2008) performed a GS study for France for the period 1990–2002. Nourry (2008) used six different GS measures (i.e. GS WB 1, GS WB 2, and GS 1- 4). All the different GS's were based on EQ 2. However, the only difference is with regards to the pollutants chosen in order to assess environmental damage. In the study, GS WB 2 takes into account damage from PM_{10} only while GS WB 1 only incorporates damage from CO_2 emissions. In the estimation of GS 1 to 4, GS 1 and GS 2 only incorporated damages from CO_2 emissions whereas GS 3 and GS 4 accounted for damages from Nitrogen Oxides (No_x), Sulphur dioxide (SO_2) and Particulate Matter (PM_{10}). In addition the Hotelling rent method was used in the valuation of rents from energy, forests and minerals.

The results of the study showed that all the values of the different French GSs were positive during the period. Therefore, France seemed to be sustainable during the period. It was also found that the use of different assessments for environmental damage also affected the value of the GS measure. Nourry (2008:445) states that the gap between GS 1 and GS 2 and between GS 3 and GS 4 is due to the different valuation of marginal damages from CO_2 emissions. In a similar way, the difference between GS1 and GS 3 and between GS 2 and GS 4 was also explained by the incorporation of damages linked to NO_x, SO_2 and PM_{10} emissions. Therefore, in this context, the choice of data sources and methods of valuation affects empirical results and thus policy recommendations.

Lin and Hope (2004) performed a GS study for Taiwan and the United Kingdom (UK) for the period 1970-1998. In the case of Taiwan, Lin and Hope (2004:19) calculated the annual GS as:

GS = GDS – CFC + EE – APC – WPC – DNR – CO_2**..... [EQ3]**

where: GDS = Gross Domestic Savings

CFC = Consumption of Fixed Capital (Depreciation)

EE = Education Expenditure

APC = Air Pollution Costs

WPC = Water Pollution Costs

DNR = Depletion of Non-renewable Natural Resources

CO_2 = Carbon dioxide damage Costs

Lin and Hope (2004:15) found that during the period in question the annual Taiwan GS had been positive. Thus, when associated with its economic activities, the country's overall capital wealth could still be sustained for future use and development. Moreover, Lin and Hope (2004:15) state that the average GS ratios to GDP were higher in the 1980s and 1990s than in the 1970s. This was attributed to the Taiwanese government's good environmental policy performance coupled with slow economic growth during the 1980s and 1990s. In the latter respect, less pollution is attributed to slower economic growth which thus contributed to the positive GS values.

In the case of the UK, Lin and Hope (2004:19) calculated the annual GS as follows:

GS = GDI + EE + CAB – CFC – APC – WPC– DNR – CO_2**..... [EQ4]**

where: GDI = Gross Domestic Investment

EE = Education Expenditure

CAB = Current Account Balance after Official Transfers

CFC = Consumption of Fixed Capital (Depreciation)

APC = Air Pollution Costs

WPC = Water Pollution Costs

DNR = Depletion of Non-renewable Natural Resources

CO_2 = Carbon Dioxide Damage Costs

Lin and Hope (2004:16) mention that the results revealed that from the 1970s to the 1980s, the average annual GDP growth rate of the UK increased slightly (from 2.0 per cent to 2.7 per cent), which meant that the economy grew and developed in this context. However, the average annual GS ratio to GDP went down (from 6.6 per cent to 4.6 per cent) during the same period. Lin and Hope (2004) state that this means that the more developed an economy is, the more likely is natural resource depletion and environmental degradation, which then results in lower GS values. From the 1980s to the 1990s, however, the average annual GDP growth rate fell (from 2.7 per cent to 1.9 per cent), while the average annual GS ratio to GDP increased (from 4.6 per cent to 6.8 per cent). Likewise, when economic activities were minimal, resource depletion rates and pollution decreased, and the GS rates, alternatively, increased. Lin and Hope (2004:16) therefore concluded since the U.K. GS values were positive during the period, the country did not move toward an unsustainable path when using its human-made, natural, and human capital to promote its economic development.

In comparing the Taiwan and the UK GS, Lin and Hope (2004:17) mention that it is interesting that the UK as a developed country had lower average annual GDP growth rates than Taiwan throughout the 1970s, 1980s, and 1990s. Moreover, along with economic activities, the UK also had a slightly lower average GS ratio to GDP than Taiwan between 1970 and 1998. In particular, the average annual ratio of GS to GDP for Taiwan increased considerably in contrast to that of the UK, of which, during the 1970s-1990s period fluctuated moderately. Therefore, Lin and Hope (2004:17) concluded that the results confirmed that the UK was a matured and developed economy with stable economic conditions, whereas Taiwan was an emerging economy undergoing rapid economic growth, during the period.

Ferreira and Moro (2011) computed GS for the Republic of Ireland over the period 1995 to 2005. The authors modified EQ 2 by employing the net present value method to assess resource depreciation, including external costs from Sulphur dioxide (SO_2) and Nitrogen Oxide (NO_x) emissions and estimating human capital accumulation using the returns to education. Ferreira and Moro (2011:5) thus calculated GS as:

GS = GNS – FCD – NRD – ED+ HC**……..... [EQ 5]**

where: GNS = Gross National Savings

FCD = Estimates of fixed capital depreciation

NRD= depletion of natural resources

ED = Environmental degradation

HC = Human capital accumulation

Ferreira and Moro (2011) found that Ireland had negative GS values for three consecutive years, from 1995 to 1997. In addition, they state that this comes as a surprise because previous studies had consistently shown that developed countries did not seem to be affected by sustainability problems. The authors also added that Hanley *et al.,* (1999) was the only previous study that found negative GS for a developed economy (Scotland) for the period 1980-1994. However, contrary to the Hanley *et al.,* (1999) results, Ferreira and Moro (2011) state that their negative GS results for Ireland were not caused by volatile prices of natural resources but rather by externalities arising from air emissions.

Brown, Asafu-Adjaye, Draca and Straton (2005) constructed a GS for Queensland, Australia for the period 1989-1999. Brown *et al.,* (2005) also followed the World Bank (1997) method. The aim of the study was to compare Queensland's GS rate to the World Bank (1995) estimates of Australia's GS rate for the same period. The authors motivate the importance of their study by stating that conducting an analysis of the World Bank's approximate GS rate at the state level (Queensland) was useful because local sustainability issues which might otherwise be missed in an aggregate or national level analysis are considered. Brown *et al.,* (2005) found that since 1989, Queensland's GS rate had fallen from 7.9 per cent to 2.3 per cent. The average GS rate for the period was found to be 2.8 per cent, which was lower than the equivalent estimate for Australia as a whole (4.8 per cent). The main reason for this trend given by Brown *et al.,* (2005) was that Queensland had a higher rate of natural capital depletion than the rest of Australia due to mining and extensions to human-made capital.

3.4 HUMAN DEVELOPMENT INDEX (HDI)

The Human Development Index (HDI) is a composite index introduced by the United Nations Development Programme (UNDP) in the Human Development Report (HDR) in 1990 (UNDP, 1990). Morse (2003:282) mentions that the HDI was an attempt to move the development debate beyond the domain of economic indicators such as GNP and GDP by

incorporating elements for education and health. Therefore, the intention was to create a composite index that could measure the development of human beings. Sagar and Najam (1998:250) state that the HDR maintained that there were three essential aspects of development and those were; for people to lead a long and healthy life, to acquire knowledge and have access to resources in order to achieve a decent standard of living.

Therefore, in the HDI, longevity is measured using life expectancy at birth. This also serves as a proxy for other aspects of well-being such as adequate nutrition and good health. Knowledge is measured using literacy rate and school enrolment, which are intended to reflect the level of knowledge of the adult population and investment in the youth. Access to a decent standard of living is measured using GDP adjusted to reflect purchasing power parity and the threshold effect using a logarithm of real GDP per capita (Costanza *et al.*, 2009:19).

Morse (2003:282) therefore concludes that the overall goal of the HDR was to create an index that would be simple to calculate, transparent and be able to attract the attention of politicians, policy-makers and the public in general.

3.4.1 THEORETICAL AND CONSTRUCTION ISSUES CONCERNING THE HDI

As mentioned before the HDI is constructed using three elements that are different but related. The first is life expectancy, the second is adult literacy combined with years of schooling or enrolment in primary, secondary and tertiary education and the third is real GDP per capita.

Hicks (1997:1286) states that the HDI is determined for each country by combining these variables from each of the three dimensions as discussed above. The index X_i, for each dimension I (i=l for income, i=2 for education, i=3 for longevity) for a given country is[17] :

X_i = (actual x_i value – minimum x_i value) / (maximum x_i value – minimum x_i value)**.....[EQ 6]**

Hicks (1997:1286) mentions that the assigned maximum value of x_i is the greatest value that a country would be expected to have in that dimension. The minimum value of x_i is the minimum that a country could achieve. Morse (2003:283) states that it is this choice of maximum and minimum values in the standardisation process has been controversial. Morse

[17]The method of construction discussed here is the post-1994 method.

(2003:283) mentions that there are broadly two methods of computing these values. The first is to find them from the data set, while the second is to set them as constants. Both have been employed at various times and in various combinations. Morse (2003:283) states that the first approach dominated in the earlier HDRs (1990-1993) while the latter prevailed from 1994 onwards. Hicks (1997:1286) mentions that, post-1994, the HDR chose to set the maximum and minimum values as constants. Noorbakhsh (2008) states that this avoids a country performing badly or well from the perspective of the HDI purely because of what other countries had or had not done, thereby enabling country comparisons over time.

Morse (2003:283) states that there is an assumption of diminishing returns to GDP per capita in human development in the HDI calculation, therefore GDP per capita should be transformed before subjecting it to the standardisation process. Anand and Sen (2000:87) state that this assumption and transformation was vital given that humans do not need excessive financial resources to ensure a decent living. Morse (2003:285) mention that in 1990 this was achieved by simply taking the logarithm of the real GDP per capita but between 1991 and 1998, the logarithm method was replaced by the Atkinson (1970) formula, which most observers felt it severely penalised real GDP per capita. From 1999 to 2001, there was a return to the logarithm method as it was felt that the Atkinson (1970) formula was too severe on middle-income countries. A further change in the HDI method involved the method of calculation of the education component. Morse (2003:285) states that in 1990, the education component was based solely on the adult literacy rate. However, between 1991 and 1994, this was adjusted to accommodate the adult literacy rate and the number of years spent at school. Morse (2003:285) mentions that from 1995 onwards, there was a further change with number of years spent in school replaced by the combined enrolment ratio (at primary, secondary and tertiary levels).

Hicks (1997:1286) mentions that the value of X_i for each country in each dimension, must fall between zero and one (inclusive). Hicks (1997:1286) adds that the value reflects the proportion achieved in the aggregate for each country, with values closer to one reflecting higher achievement levels. Conversely, the proportionate deficiency or shortfall of a country in a particular dimension is equivalent to $(1-X_i)$. Hicks (1997:1286) notes here that the maximum potential for each country has been standardized as has the minimum potential and consequently achievement has been normalized on the zero to one scale. The HDI itself is the

average of X_1, X_2, and X_3 (the indices for income, education, and longevity), where each index is weighted equally[18]. Therefore:

HDI = $(\alpha X_1 + \beta X_2 + \gamma X_3)$ **/ (**$\alpha + \beta + \gamma$**)……..... [EQ 7]**

where: $\alpha, \beta, \gamma = 1$

Hicks (1997:1286) mentions that since each X_i must be a value between zero and one (inclusive), and HDI is a weighted average; HDI[19] also must fall within the same range. In addition the author states that the assignment of α, β, and γ is arbitrary. Neumayer (2001:103) mentions that after the HDI calculation, each country's HDI value is ranked and placed within a league table. Morse (2003:283) states that the three country groupings given by the HDR are countries with 'high' human development (i.e. HDI value of 0.8 and above), countries with 'medium' human development (i.e. HDI values of between 0.5 and 0.8) and countries with 'low' development (i.e HDI values of less than 0.5).

As expected, the HDI method and choice of components have been criticised over the years. There are several critiques of the quality of the data upon which the HDI is based and also the consistency of the HDI method. Morse (2003:286) states that the shifts in method and data selection, even if the core remains, are significant and preclude easy year-on-year comparison. Luchters and Menkhoff (2000:268) state that the result of trying to follow trends in the HDI can be deterministic chaos. Lai (2000:342) also mentions that part of the problem is due to changes in the number of countries included each year, for example, a country can drop places in the table simply because new countries have been included that happen to come in at a higher rank with no change to the components of the original country itself. Moreover, Morse (2003:281) states that such movements within the HDI table can easily be accounted for by simple changes in the HDI method rather than genuine progress in human development.

Apart from the data and method consistency issues, there have been various other critiques regarding the choice of the three components. Desai (1991:356), for example, criticised that the three components are added together to arrive at the HDI, thereby making income, health and education substitutes. To avoid this, Desai (1991:356) proposes that a log additive form

[18]Dasgupta (2008:5) has noted that the UNDP has offered no plausible justification for the relative weights they attach to the three components of HDI.

[19]For sake of clarity, this post-1994 HDI version will henceforth be referred to as the 'original' HDI.

of all the components should be applied in order to restrict substitutability. Similarly, Sagar and Najam (1998: 252) propose that the basic indices must be multiplied to arrive at the HDI. Morse (2003:285) also mentions that the use of the GDP per capita component as a proxy for average income can be dubious and ignores major differences in income distribution within a country. However, Anand and Sen (2000:102) state that the GDP per capita component of the HDI is indispensable since it plays a part that the two other components of the HDI cannot serve, either directly or as proxy variables. Authors such as McGillivray (1991) and Cahill (2005) have also asserted that the HDI offers little additional information over measures such as GNP and GDP. To support this assertion, the authors cite a high overall correlation between sampled countries' GDP/GNP and their HDI scores and/or correlation amongst the components which they view as evidence of the redundancy of the index. Noorbakhsh (1998:602) states that in order to evaluate whether a composite index is a good one, there should be two fundamental conditions, firstly, the components should not be highly correlated with each other, and secondly the index itself should not be highly correlated with any of its single components. If these criteria are satisfied, the composite index is not redundant. Noorbakhsh (1998:602) however, found that the individual components of the HDI were not highly correlated with each other, nor was the index itself highly correlated with any of its components, so the author concluded that HDI could not be considered as redundant. Kelley (1991: 315) also argued that HDI offers only limited insights beyond those obtained by slight modifications to simple measures of economic output. Kelley (1991: 315) states that before the conceptual underpinnings of the HDI are fixed or improved, analysts and policymakers are better served by using much simpler measures and methods for evaluating human development.

Other critics of the original HDI method have proposed to widen the coverage of components that comprise the HDI in order to improve it. Sagar and Najam (1998: 263) state that the HDI has neglected links to sustainability by failing to investigate the impact and contribution of the natural system to national income and hence to HDI. Sagar and Najam (1998:263) therefore consider the need for the introduction of some mechanism that can account for over-exploitation of natural resources in order for the HDI to capture the sustainability dimension of human development. Neumayer (2001:103) agrees with this notion and states that natural capital should also be included in the construction of HDI and should be

acknowledged as a major enabling factor in human development.[20] Other authors who have proposed expansions/modifications of the original HDI will be referred to in the forthcoming section.

3.4.2 EMPIRICAL LITERATURE CONCERNING THE HDI

McGillivray (1991) used a statistical analysis to test whether the HDI was a useful tool in performing inter-country development comparisons. McGillivray (1991:1462) mentions that a vital part of the test was to ascertain if HDI was a redundant development indicator by investigating the intensity of association between the HDI and its component variables as measured by zero-order (or simple) and rank order correlation coefficients. McGillivray (1991:1462) stated that if a significant positive correlation existed between the HDI and any one of its components, then it was sufficient evidence that HDI reveals few additional insights into inter-country development levels and can be viewed as redundant (i.e. the degree of redundancy is greater the closer a given coefficient is to one). Conversely, an absence of such a correlation was viewed as sufficient evidence that the HDI was a useful development indicator. McGillivray (1991) therefore calculated correlation coefficients using a sample comprising 130 countries, together with subsamples separately comprising those countries classified by the UNDP report (1991) as low, medium and high human development countries (LHD, MHD and HHD respectively) and those separately classified as developing and industrial countries. McGillivray's (1991:145-1467) results after performing the statistical analysis revealed that , firstly, the composition of the index was flawed as it was significantly and positively correlated with each of its component variables individually; thus, assessing inter-country development levels on any one of the variables yields similar results to those that the HDI index itself yields. Moreover, with the exception of a minority of country groups, the index was barely more informative regarding inter-country development levels than GNP per capita. Considering these results, McGillivray (1991:1467) concluded that the HDI was a redundant composite inter-country development indicator.

[20] It is worth mentioning here that income equality adjusted HDI's and gender related development indices have been published in the HDR's over the years and Neumayer (2001:103) thought that the environmental aspect should also be given equal attention by the UNDP.

Cahill (2005) updated McGillivray (1991) study, to ascertain whether the individual components in the original HDI were highly correlated. Cahill (2005) used similar methods to those developed by McGillivray (1991), however, the analysis was extended by employing alternative weighting schemes to the component variables. Cahill (2005:3) found that the statistics used in the HDI were so closely correlated with one another that indistinguishable alternative indices could be created from the same statistics with very different weights. For example, Cahill (2005:3) mentions that, an index that consists of a 58 percent weight on adjusted GDP, 24 percent on the education index and 19 percent on the life expectancy index was statistically indistinguishable from the HDI. In addition, it was found that an index that consists of an 89 percent weight on adjusted GDP and the remaining weight on the education index has a 0.95 correlation with the HDI. Thus most of the information about the HDI was captured in GDP per capita. Cahill (2005:4) stated that the results were consistent with McGillivray (1991) and agreed with the notion that the HDI was a redundant composite inter-country development indicator.

Noorbakhsh (1998) also examined the components and structure of the original HDI. However, contrary to Cahill (2005) and McGillivray (1991), Noorbakhsh (1998) found that the HDI seemed to have the desired properties of a good composite index. That is, their components were not highly correlated with each other and the index itself was not highly correlated with any of its individual components. Noorbakhsh (1998) therefore concluded that there was a lack of evidence supporting the notion that the HDI, as compared with its components, was redundant.

Neumayer (2001) attempted to create a modified version of the original HDI which incorporated sustainability in its construction. Neumayer (2001:101) contended that linking the HDI with sustainability would allow the UNDP to check whether a country is ‘mortgaging the choices of future generations’. In order to achieve this Neumayer (2001) used the World Banks (1997) Genuine Savings (GS) measure as a proxy for sustainability (i.e. accounts for natural capital depreciation) and also kept the original HDI (1999) intact. The study included 155 countries for the period 1970-1998. Neumayer (2001:108) states that countries that exhibited negative savings rates appeared to be unsustainable therefore it was not necessary to compute their GS. Neumayer (2001:108) states that when GS was computed for the countries that had positive savings rates (i.e taking into account natural capital depreciation), countries such as Nigeria, Oman, Syria and Togo also became 'potentially'

unsustainable. A common feature for most of these countries is that they all exhibited relatively low reserves to extraction ratios of oil in the case of Nigeria, Oman and Syria, while Togo had low reserves to extraction ratio for phosphate. Neumayer (2001:108) states that in contrast with the aforementioned countries, nations with high reserves to extraction ratios did not become unsustainable when natural capital depreciation was considered. These countries included Russia for natural gas, Iran, Kuwait, United Arab Emirates, Saudi Arabia and Venezuela, in terms of the oil reserve to extraction ratio. According to Neumayer (2001:109) this was to be expected as high reserves to extraction ratio means that only a small share of the total resource stock is used up by current resource extraction.

Cooke, Beavon and McHardy (2004) presented a Modified Human Development Index (MHDI). This Modified HDI was used to compare the educational attainment, average annual income, and life expectancy of Registered Indians[21] against other Canadians/Reference population (i.e. Canadians which are not Registered Indians) using 1981–2001 Canadian Census data. Cooke *et al.,* (2004:6) mention that the variables used to calculate the educational attainment index for Registered American Indians and other Canadians were not the same as those used to calculate the original HDI. Cooke *et al.,* (2004:6) state that the proportion of the population fifteen years and older that had attained grade nine or better was substituted for the adult literacy rate while the proportion of the population nineteen years and older that had attained a high school diploma/technical/ post-secondary education with or without a high school diploma is used as a proxy for the gross enrolment ratio. Cooke *et al.,* (2004:7) also replaced the proxy for average individual income, per capita GDP by the average annual income from all sources as reported in the census and was subsequently adjusted by the Consumer Price Index (CPI) and discounted according to the original log formula. Life expectancy at birth estimates for Registered Indians were taken from a series of projections of the Registered Indian from Canadian national statistics. The reference population life expectancies were estimated by adjusting the total Canadian life expectancies to account for the Registered Indian population. Since no life expectancy data was available for 2001 during the period of the study, Cooke *et al.,* (2004:7) assumed that the improvement in Canadian life expectancy at birth that occurred between 1991 and 1996 occurred as well between 1996 and 2001. Cooke *et al.,* (2004) found that the gap in the overall MHDI scores between Registered Indians and other Canadians narrowed from 0.18 in 1981 to 0.12 in 2001.

[21]Registered under the Indian Act of Canada.

While both populations improved in terms of human development between 1981 and 2001, gains were found to be greater for the Registered Indian population.

The results of the individual components against the overall MHDI was also presented by the authors. Cooke *et al.,* (2004:9) mention that the educational attainment of Registered Indians showed no real improvement during the first five years of the study period. Cooke *et al.,* (2004:9) also mention that Registered Indians experienced a greater increase in life expectancy at birth than other Canadians during the period. Although there were substantial gains made by Registered Indians in life expectancy and education, the 1981–2001 period saw much less progress in terms of average annual income. The average annual income gap between Registered Indians and other Canadians actually increased between 1981 and 1991. Cooke *et al.,* (2004:9) state that the slight improvement between 1991 and 1996 was largely due to a decrease in average annual income among the reference population, and income for Registered Indians was still less than for other Canadians in 1996. The average annual income for Registered Indians improved over the entire 1981–2001 period, but remained well below the level experienced by other Canadians. Cooke *et al.,* (2004:22) conclude that despite its deficiencies, the HDI reveals that there are important and continuing differences in the average achievement of Registered Indians and other Canadians in life expectancy, income, and educational attainment. While these do not capture well-being in its entirety, they present important issues for researchers and policy-makers.

Morse (2003) presented results of revised HDI's for a sample of 114 countries. Morse (2003:281) states that the purpose of the study was to explore the volatility of results presented by the original HDI due to the inconsistent method employed by the UNDP over the years in its construction of the HDI. In order to achieve the goal of the study, Morse (2003) constructed revised HDI's using the different methods employed by the UNDP over the years. Out of the three components, Morse (2003), decided to only adjust two (i.e life expectancy and real GDP per capita), stating that the education component was not altered as its form had changed significantly over the years of the HDR. Therefore in the new HDI's construction, the minimum and maximum values were taken from the data set (as per the pre-1994 method) and then alternatively were set as constants (as per the post-1994 method). The income component (real GDP per capita) was then transformed using both the logarithm formula (for the years 1990, 1999-2001) and alternatively the Atkinson (1970) formula (for the years 1991-1998). Once the HDIs had been recalculated, the countries were ranked in

terms of their new modified HDI values and these new positions were then compared with the ranks based on the original HDI formula. Morse (2003) results showed that deviations (negative and positive) from the original HDI rank occurred frequently. Morse (2003:289) states that deviations that arise from changing the life expectancy calculations (Maximum and Minimum values set as constants versus taken from data set) induced an overall +/- 6 rank movements within the countries. Morse (2003:289) also mentions that deviations from the change of the transformation method of real GDP per capita (logarithm versus Atkinson (1970) formula) were greater than for life expectancy. For example, Morse (2003:289) states that in the years 1992, 1995 and 1996 " South Africa, Botswana and Algeria, respectively, changed rank by +/-10 – 15 places when the log GDP per capita method was used instead of the Atkinson (1970) formula". Morse (2003:290) mentions that the results from these analyses add further confirmation to the comments of Luchters and Menkhoff (2000) and Booysen (2002) regarding the difficulties of making valid comparisons between HDI rankings across years. In addition, Morse (2003:290) states that the results of the study suggest that the HDI based league table placements are invalid as a means of informing policy decisions unless there is consistency in the HDI method.

Crafts (2002) presented revised estimates for the HDI for the benchmark years of 1870, 1913, 1950, 1975 and 1999, based on real GDP per capita data. The estimates in the study were based on the original HDI formula; however, they differ from the original formula only with regard to the income variable. Crafts (2002:396) mentions that the diminishing returns assumption in the income variable in the original HDI penalises high income countries. Crafts (2002:396) mentions that the revision to the formula in the study was to relax this assumption thereby allowing additional income in high income countries to add a bit more to HDI. Crafts (2002:398) mentions that the income data for the years 1870, 1913 and 1950 are based on the UNDP (1999) estimate worked back through time using growth rates, while the estimates for HDI in 1975 and 1999 for the countries observable in 1950 are taken directly from UNDP (2001).

The study found that the revised HDI scores differed from the original HDI estimates. The revision to HDI reduced the gap between the leading economic area on the one hand and Africa and India on the other, both in 1913 and in 1950. The discrepancy between the weighted average of the African observations and North America and Western Europe also had diminished by 1999. Crafts (2002:399) mentions that during the period between 1950

and 1999 absolute increases in HDI were generally found in countries that were some way behind the leaders in 1950, although, with the notable exception of China and some least developed countries. In addition, Crafts (2002:399) mentions that the possibilities of improving HDI were so favourable in this period, given mortality rates, that even very poor performers in the third world gained slightly.

In terms of the relative success and failure in improving HDI performance for the 1950-1999 period, Crafts (2002:399) found that the outstanding performers were the countries which experienced catch-up growth. Examples are Japan, South Korea, Singapore and Hong Kong in Asia and Spain, Finland, Portugal and Italy in Europe. The worst performers were found to be African countries such as Mozambique, Zaire and Angola. Crafts (2002:401) also mentions that the repercussions of communism and its subsequent abolition also affected the rankings of countries such as Russia, the Czech Republic and Hungary.

In addition, Crafts (2002:401) also observed that HDI scores in today's poor countries compared very favourably with those of the leaders in 1870. For example, the results revealed that, Sierra Leone, which had the lowest HDI, according to UNDP (2001), was roughly on par with Japan and Italy's 1870 HDI score. Crafts (2002:401) states that these results were driven by the worldwide improvement in life expectancy during the twentieth century. However, Crafts (2002:401) mentions that over the same period the gap between real GDP per capita in the poorest and the richest countries widened considerably.

Crafts (2002:404) also observed that when HDR categories are used (i.e. 'low' (0.5) to 'medium' (0.5–0.8) to 'high' (0.8) human development), it is found that, by the year 1999, 48 countries were classified by UNDP (2001) as 'high', 78 countries as 'medium' and only 36 countries 'low'. By contrast, in 1870 only a select few countries had just reached 'medium' human development and none were 'high', a level that the leading OECD economies only attained after 1950. Crafts (2002:404) therefore mentions that overall, viewing the twentieth century through the lens of the HDI rather than on a national accounts gives a distinctly more optimistic picture of the experience of economic development in the world, with improvements in life expectancy being the driver of this improvement.

Vega and Urrutia (2001) developed a pollution-sensitive Human Development Index (HDPI) for 165 countries for the period 1993-1998. The method used to determine the HDPI was based on the original HDI method. However the HDPI attempted to incorporate into the

original HDI an environmental element (H_3P), measured in terms of CO_2 emissions from industrial processes per capita. Vega and Urrutia (2001) state that the HDPI thus penalises (through H_3P) those countries which have obtained growth in income at the expense of damaging the environment.

The results of the study were presented in the form of a table which showed the change in rank under both the original HDI and HDPI. Vega and Urrutia (2001:206) mention that positive numbers indicated that countries had moved up the order with the application of the HDPI, and negative numbers indicated that they had moved down. The results revealed that the country's most affected by the introduction of pollution factor were oil-producing and industrial countries. Vega and Urrutia (2001:206) state that oil producers in particular dropped considerably compared with other countries, for example, the UAE dropped 68 places, Kuwait 55, Qatar 37, Saudi Arabia 24 and Bahrain 23, during the 1993-1998 period. Industrialised countries where CO_2 emissions were greater than 15 tonnes per capita annually were also heavily penalised and dropped in the rankings, for example, the USA dropped 24 places, Luxembourg 18, Australia 14 and Norway 13. Vega and Urrutia (2001:210) mention that the opposite effect was observed in other countries, such as Spain, France, New Zealand, Switzerland, Sweden and Italy. In this group, CO_2 emissions were found to be less than 8.5 tonnes per head of population, so they were not penalised and therefore climbed the list. Vega and Urrutia (2001:210) state that within newly industrialised countries, Singapore was the country most heavily penalised by the pollution factor and it dropped by 17 places. However, Thailand, Hong Kong and the Republic of Korea climbed up the order in spite of being penalised. Vega and Urrutia (2001:211) also observed that underdeveloped countries moved very little in the order in spite of improvements in their index ratings while highly developed countries decreased the most. The authors attributed this drop to excessive emissions of the carbon dioxide (CO_2) pollution by the more developed countries compared to the least developed.

Nourry (2008) also constructed a French HDPI for the period 1990-2000. To compute the French HDPI, Nourry (2008) based his method on the Vega and Urrutia (2001) study. The data used was extracted from the World Bank (GDP per capita), the French statistical institute INSEE (life expectancy), UNHDR and the French Ministry of Education (adult literacy and school enrolment rate) and also the World Resource Institute (CO_2 emissions per capita). Nourry (2008:449) found that both the overall original HDI and HDPI values

increased during the decade, however, the value of the French HDPI was found to be less than that of the original HDI. Nourry (2008), thus, stated that the result was a confirmation that the incorporation of an environmental variable into the HDI reduces its value.

Similar to Vega and Urrutia (2001), Costantini and Monni (2005) constructed a Sustainable HDI (SDHI), which sought to include additional social and environmental factors to the original HDI. The SHDI was calculated as the simple average of the four development components, education attainment (EDU), social stability (SOC) as represented by the unemployment rate instead of life expectancy, sustainable access to resources as represented by 'Green net national product' (GNNP) and environmental quality (ENV) represented by pollution (soil ,water and air) and energy consumption. The authors subsequently compared the SHDI with GDP and the original HDI for the period 1992-2002 for a sample of 37 countries.

As part of the study, Costantini and Monni (2005) first performed a correlation test on both the original HDI and SHDI. The results showed that the original HDI was highly correlated with GDP; whereas the SHDI showed a lower correlation level with GDP compared to the original HDI. Correlation between the SHDI and its components was also considered. Costantini and Monni (2005:340) found that the SHDI seemed to be highly dependent on its components. The authors thus asserted that high correlation of the SHDI with its components confirmed that a sustainable human development process is highly dependent on capital formation, investments in human capital and conservation of natural resources. Furthermore, the GNNP component was found to have a very low correlation with the environmental (ENV) component meaning that the two 'sustainability' variables were valid.

The results of the comparison between the original HDI and SHDI revealed divergences in the rankings of the sample countries. Costantini and Monni (2005) decided that the results would be best interpreted by separating the 37 countries into four country groups; the accession countries, the European Union, other OECD European countries, and transition economies, as shown in Table 1 and Table 2 of Appendix A (Costantini and Monni, 2005:345).

Costantini and Monni (2005:343) found that the (EDU) component explained most of the SHDI growth rate within accession countries and the European Union, and it also had a similar trend for transition economies. Costantini and Monni (2005:343) also found that the

(SOC) component and the (ENV) component both had a great effect in accession countries and transition economies, reducing the performance in terms of sustainable development. In addition, it was found that the tertiary gross enrolment ratio had a higher growth rate in the European Union than the other country groups.

Costantini and Monni (2005:343) also found that Accession countries received a better ranking with the SHDI in 2002 than with the GDP or original HDI. In addition, the SHDI performance for this group was better than for transition economies and in some cases better than the European Union and other OECD countries. The authors noted that the Nordic countries performed very well in terms of their SHDIs, for example Sweden, Norway, and Finland occupied first, second, and third places, respectively, in the ranking. Costantini and Monni (2005:343) attribute this good performance to the education (EDU) component, which in the three mentioned countries was higher than in the other countries. Costatini and Monni (2005:343) however, note that both Sweden and Finland stand in a substantially lower position in the GDP ranking compared with the SHDI and HDI and they view this as further evidence that human development does not necessarily depend on GDP growth.

When considering the European Union, Costantini and Monni (2005:347), found that countries like Spain (25) and France (24) were penalized due to a worsening of the environmental (ENV) component and an increase in unemployment. Costantini and Monni (2005:347) also mention that Spain was last in the environmental ranking due to high intensity of fertilizers and pesticides used in the economic production process. The results also revealed that Ireland lost eight places in the SHDI ranking compared with the GDP, mainly due to a lower educational level. However, the SHDI performance of Ireland in the past decade (1992-2002) increased by six places due to an improvement in GNNP growth and good employment performance.

Costantini and Monni (2005:345) state that due to the economic recession experienced by transition economies during the 1990s, which caused a substantial drop in employment and a worsening of environment conditions, as revealed by the SHDI, the former communist countries such as Ukraine (217), Moldova (213), the Russian Federation (28), Lithuania (25), and Bulgaria (23) showed a declining performance.

Therefore considering the overall results of the study, Costantini and Monni (2005:347), mention that a wider measure of development such as the SHDI is useful, in that it reveals

factors affecting policy actions which could not be picked up by measures such as GDP and the original HDI.

Nourry (2008) also constructed a SHDI for France for the period 1990-2000. To calculate the French SHDI, Nourry (2008), followed Costatini and Monni (2005) method. Data was taken from, the French statistical Institute INSEE and the French ministry of Education (tertiary gross enrolment ratio), the United Nations Economic Commission for Europe (UNECE) (unemployment rate), the World Bank and INSEE (GNNP per capita), the European Environmental Agency and the World Resource Institute (air, water and soil pollution). Nourry (2008:450) results revealed an upward trend for both measures; however, the value of the SHDI was lower than that of the original HDI. Nourry (2008:450) mentions that in comparison with the Vega and Urrutia (2001) HDPI, the gap between the SHDI and the original HDI was larger, suggesting that the incorporation of additional social and environmental 'sustainability' factors decreased the value of the HDI even farther.

Escosura (2010) proposed an 'Improved' HDI (IHDI) informed by welfare economics. The study compared the IHDI with the original HDI for the world and its main regions over the period 1870–2005. Escosura (2010:1) states that the IHDI is fundamentally different to the original HDI because its' social, non-income dimensions are derived using a convex achievement function as an alternative to the linear transformation employed in the original HDI. In an attempt to reduce substitutability among the index components, the IHDI's three dimensions (longevity, access to knowledge and average incomes) were combined into the IHDI using a geometric average, rather than the arithmetic average used in the original HDI. Escosura (2010:2) mentions that under the geometric average approach an improvement in the IHDI would only occur if all dimensions improve, and not only one, as is the case in the original HDI. Escosura (2010:8) mention that there was a substantial improvement in world human development during the entire study period. Escosura (2010:8) states that when the results for the IHDI and the original HDI were compared, the same upward trend was confirmed, however, a widening absolute gap between the two measures was observed, with IHDI lagging behind.

When the results of the levels and rates of change in the main regions of the world were compared, Escosura (2010:9) results appeared to confirm Crafts (2005) results. It was found that advanced countries (OECD) only crossed the 0.5 'medium level' threshold in the 1950s,

and landed in the 'medium level' to 'high level' of human development band (i.e. 0.5-0.8) in the subsequent years. Other regional results that Escosura (2010:9) found were that Central and Eastern Europe (including Russia) experienced a catching up to the OECD between the 1920s and 1960, driven by Soviet Russia's gains in human development, Escosura (2010:9) does however, mention that these catch up gains did eventually stagnate and diverge at a later stage. Latin America, also caught up to the OECD until the 1970s, but only reached the 'medium level' at a later stage. Asia, on the other hand, started from low levels similar to those of Africa up to the early 1920s and improved significantly until 1970 and, again, at the turn of the century. A sustained improvement took place in Africa between the 1920s and the 1970s, with the most intensity in the 1930s and 1950s. As opposed to Asia, this improvement has subsequently slowed down since 1980. Thus, Escosura (2010:10) mentions that Asia's catching up and Eastern Europe's falling behind led these two regions to converge with Latin America, whereas Africa and the OECD tend to diverge at low and high levels of human development.

Escosura (2010:27) states that when compared to the original HDI, the IHDI shows systematically lower levels of human development for the developing countries. Thus, the gap between rich and poor countries is revealed and a much less optimistic view than the conventional original HDI results is offered. Therefore, Escosura (2010:27) states that the findings in the study highlight the need to increase levels of human development in developing countries, by improving life expectancy and secondary and tertiary education.

Hicks (1997) study attempted to incorporate distributional inequalities of income, education, and longevity into the framework of the original HDI[22]. The study constructed Gini coefficients, for a set of 20 developing countries and measured inequalities in annual income, educational attainment, and life-span attainment. The components were adjusted through a process of discounting; thereafter the results were combined with data from the original HDI to produce an Inequality-Adjusted Human Development Index (IAHDI).

Hicks (1997:1293) found that the transformation process (from HDI to IAHDI) resulted in changes in the HDI rank of some countries, for example, Guatemala fell by two spots and the

[22]HDR (1993) presented an income inequality adjusted HDI, but ignored the other two components in their adjusted HDI construction; therefore Hicks (1997) attempted to include these.

Republic of Korea gained two spots in the HDI rankings. Sri Lanka, Malaysia, and Thailand also all moved up the rankings by three, four, and four spots, respectively.

Hicks (1997:1291) states that the most important finding in the paper is with regards to the Latin American region, which was historically known to have the most severe income distribution problems. Hicks (1997) found that when development was calculated without factoring inequality (original HDI), the Latin American countries performed relatively well; however, the results change significantly when inequality is considered (IAHDI), whereby the Latin American countries fall in the rankings. Therefore Hicks (1997:1293) states that inequality is not a problem with regards to income only, but it is also a problem in education and health. Therefore the IAHDI framework allows for addressing all of these inequalities.

3.5 CONCLUSION

This chapter contained a review of the alternative objective measures of economic performance and social development. The first measure that was reviewed was the ISEW. The measure makes deductions from personal consumption to account for certain social and environmental factors that are neglected in the SNA and GDP framework. The notion behind the measure is that if ISEW is stable or increasing in a given year, the stocks of natural and human-made capital on which all goods and services flows depend, will be at least as great for the next generation while if ISEW is falling it implies that the economic system is eroding those stocks and limiting the next generation's prospects. The empirical literature review undertaken in the study revealed that, despite differences and criticisms of the method, most European and North American studies (including some from developing countries) found that the ISEW tracked GNP/GDP over a period of years and then at some point during the period began to diverge from the trend. There was however exceptions to this trend but these were mostly attributed to the omission of important variables that contribute to the divergence. The main reason for the divergence given by the different authors is that the divergence occurs due to negative social and environmental policies employed by the various countries that are detrimental to sustainability.

The second measure that was analysed in the study is the GS. The GS measure was found to be quite similar to the ISEW; however, it is constructed by subtracting net depreciation of

natural capital from net investment in produced capital and adding investment in human capital. It was also found that the GS was essentially a measure of *weak* sustainability and as such assumes perfect substitutability between all forms of capital. Theoretically the measure is supposed to monitor the stock of capital that will be available for future generations in a country; therefore persistent positive GS values indicate a sustainable development path while persistently negative GS values indicate an unsustainable one. The main criticism levelled against the measure was found to be with regards to notion that it was a *weak* sustainability measure. Authors highlighted that *weak* sustainability was a very narrow conception of what sustainability means, and therefore needed to be expanded in order to incorporate environmental and social variables that are important when assessing national sustainability. When the empirical literature review was conducted, the main findings were that low or negative GS values were exhibited mainly by countries which were highly dependent on natural resources and had low extraction to savings ratios. It was also found that some results revealed that low/ negative GS values were prevalent in low income countries.

The last measure reviewed in the chapter was the HDI. The HDI aggregates GDP per capita, life expectancy at birth, adult literacy rate, combined primary, secondary, and tertiary gross enrolment ratios with the primary intention of measuring human development. After this aggregation, HDI values for each country is ranked and placed within a league table. The lack of consistency in the HDI method was heavily criticised by authors, including suggestions that the measure could be redundant because of the high correlation between itself and its components and amongst the components themselves. However the main criticism of the HDI was with regards to the HDI's omission of environmental factors in its assessment of human development. Due to these criticisms, proposals to expand the scope of the HDI were put forward. These were discussed in the empirical literature review and included modifications such as a pollution-sensitive HDI (HDPI) and a sustainable HDI (SHDI), amongst others. The results found in the empirical literature showed that the introduction of additional variables in the HDI framework, especially environmental factors, resulted in major changes in countries HDI rankings, with more industrialised and resource dependent countries falling in the rankings, while those countries that employed environmental friendly productive techniques climbing up the rankings.

CHAPTER FOUR

EVALUATION OF NATIONAL ACCOUNTS AND ALTERNATIVE OBJECTIVE MEASURES AGAINST SUSTAINABLE DEVELOPMENT THEORY

4.1 INTRODUCTION

In the foregoing chapters, the concept of Sustainable Development (SD) was mentioned briefly when reviewing the National Accounts and alternative objective measures of economic performance and social development. This chapter contains an elaboration of the notion of sustainable development and also evaluates the extent to which the National Accounts and the alternative objective measures are consistent with Hicksian and Fisherian income, which embody the concepts of sustainability and sustainable development.

Therefore this chapter will be organized as follows: Section 4.2 will attempt to define sustainable development. Section 4.3 will provide descriptions of Hicksian and Fisherian definitions of income, respectively. Section 4.4 will compare the National Accounts and alternative objective measures (i.e. ISEW, GS and HDI) against sustainable income/development theory. Section 4.5 concludes the chapter.

4.2 SUSTAINABLE DEVELOPMENT (SD)

Turner, Graham, McGregor and Swales (2006:3) state that there is no universal agreement on the definition of sustainability and sustainable development (also see Lele (1991) and Talberth *et al.*, (2006). However, Turner *et al.*, (2006:3) mention that sustainable development is usually defined in accordance with the Brundland Commission Report (WCED, 1987:43), which states that "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Turner *et al.*, (2006:3) state that this description of sustainable development allows for a definition of sustainability from which practical sustainability principles can reasonably be

derived. Therefore, a minimum condition for ensuring the ability of future generations to meet their needs is to maintain the productive capacity of the system. In other words, to preserve for future generations the potential to enjoy the same levels of consumption attributed to the current generation. Productive potential at any time depends on the stock of productive assets, including the capital stock that is available for use. Turner *et al.,* (2006:3) thus state that sustainability involves the maintenance of that stock of assets, which includes both human-made and natural capital. Turner *et al.,* (2006:4) therefore considers sustainability in terms of maintaining the capital base of the system, effectively living off the returns to that capital. As mentioned, Talberth *et al.,* (2006:4) also states that sustainability involves three principles of economic, environmental, and social sustainability and a key meta-principle being that social, environmental and economic needs must be met in balance with each other for sustainable outcomes to occur in the long term. Harris (2000:5-6) mentions that an economically sustainable system must be able to produce goods and services on a continuous basis, to maintain manageable levels of government and external debt, in addition the system should avoid extreme imbalances which could be detrimental to agricultural or industrial production. Harris (2000:5-6) also mentions that an environmentally sustainable system, on the other hand, must maintain a stable resource base by avoiding the over-exploitation and depletion of those resources. In addition, Harris (2000:6) states that a socially sustainable system must achieve distributional equity, Provide adequate provision of social services and achieve political accountability and participation. Harris (2000:6), however, does concede that these three elements of sustainability introduce many potential complications to the WCED (1987) definition, such as, how to balance the multi-dimensional objectives and how to judge success or failure of these objectives.

Giddings, Hopwood and O'Brien (2002:189) state that a major limitation of this three principle approach to sustainable development is that it assumes the separation and autonomy of the economy, society and environment from each other. Thus, it encourages sustainable development to be viewed in a compartmentalized manner. Giddings *et al.,* (2002:189) state that this separation underplays the fundamental connections between the economy, society and the environment and therefore leads to assumptions that trade-offs can be made between the three sectors, in line with the views of *weak* sustainability that human-made capital can replace or substitute natural capital[23]. Giddings *et al.,* (2002:194) therefore suggest that

[23]For example, Giddings *et al.,* (2002:189) state that no number of sawmills will substitute for a forest, no

sustainable development needs to be based on principles that would apply to all issues whether they are classified as environmental, social, economic or any mix of the three. Giddings *et al.,* (2002:194) thus, mention that Haughton (1999) five equity principles could provide a better concept of sustainable development. Haughton (1999) five equity principles therefore include Futurity (inter-generational equity), Social justice (intra-generational equity), Transfrontier responsibility (geographical equity), Procedural equity (people treated openly and fairly) and Inter-species equity (importance of biodiversity). Giddings *et al.,* (2002:194) states that these sustainable development principles can be summarized as follows; Futurity gives regard to the needs of future generations. Social, Geographical and Procedural equity takes into account social justice regardless of class, gender, race, location and participation so that people are able to shape their own futures. The inter-species principle recognizes the importance of biodiversity and ecosystem integrity. Giddings *et al.,* (2002:194) thus states that these principles move society beyond present approaches based on monetary cost/benefit analysis or approaches that justify unrealistic trade-offs (such as the three principle approach).

At this stage it is appropriate to mention that there is a long list of approaches that have been proposed by various authors in an attempt to fully encapsulate the true meaning of SD, however, as mentioned before, there is no concrete definition of sustainable development; as such, despite the inconsistencies regarding the interpretation of the definition of sustainable development and sustainability, most studies such as Harris (2000), Turner *et al.,* (2006), Daly (1990), Lele (1991) including Giddings *et al.,* (2002) regard the WCED (1987) definition as the basic framework when considering issues of sustainability and sustainable development. Therefore one approaches the concept of sustainable development with the same view.

4.3 HICKSIAN INCOME

Hicks (1946:172) states that "the purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume, in the present, without impoverishing themselves in the future". From this concept, Hicks (1946) defined income as

amount of genetic engineering can replace biodiversity and it would be nearly impossible to construct a replacement for the ozone layer.

the maximum amount that a person can consume in a week and still be as well off at the end of a week as at the beginning. Jackson and McBride (2005:15) mention that this Hicksian definition of income should be viewed as "the amount that a community can consume over some time period and still be as well off at the end of the period as at the beginning". Jackson and McBride (2005:15) also state that being as well off at the end of the period therefore depends on having the same consumption possibilities in the following period. Since these consumption possibilities flow from income streams which are generated by capital investment, this requirement has often been translated into a demand to maintain capital intact. Lawn (2008:59), in addition, states that the Hicksian definition of income has two distinct components, "what can be consumed now", and "actions that must be taken to ensure that consumption in the future is at least as great as current consumption". Lawn (2008:59) mentions that the second component is a critical feature of Hicksian income for two reasons. Firstly, satisfying this second criterion restricts what can be consumed in the present. Secondly, it ensures a 'sustainability' condition is automatically embodied within the income concept itself. Lawn (2008:59) states that, if the present level of consumption exceeds what can be enjoyed in the future (i.e. if the second criterion is not satisfied), current consumption is effectively unsustainable. Talberth *et al.,* (2006:4) add that due to its definition, Hicksian income could therefore equivalently be referred to as 'sustainable income'.

Lawn (2006:442) mentions that the appealing aspect of the Hicksian definition of income is that it recognises the need to keep the stock of income generating capital (both human-made and natural) intact. For example, should a nation, in the process of producing a particular quantity of physical goods, deplete the stock of goods-producing capital, the monetary value of its annual product will overstate its Hicksian income. Jackson and McBride (2005:15) therefore, mention that one way to arrive at Hicksian income is to subtract the net depreciation of goods- producing capital from the annual product during the period.

4.4 FISHERIAN INCOME

Fisher (1906) asserted that the national income should not consist of the physical goods (human-made capital) produced in a particular year, instead, it should consist of the subjective services (utility) enjoyed by the ultimate consumers and users of the entire stock of all physical goods. Fisher (1906) referred to the service (utility) yielded by physical goods as "psychic income". Lawn, (2006:443) states that Fisher's (1906) association of income with

service (utility) is based on two important welfare-related aspects. The first is that an increase in the rate at which certain goods are produced and consumed need not generate additional welfare benefits. Lawn, (2006:443) mentions that this is due to the fact that the cost of natural capital used in production is usually ignored by markets. Therefore production-based income measures (and Hicksian measures) will often overstate the increased welfare contribution made by higher output levels. The second aspect relates to the timing of the welfare benefits generated by physical goods. Lawn (2006:443) states that, given that income is usually measured on an annual basis, the price paid for a non-durable good will constitute a reasonable approximation of the welfare benefits (utility) enjoyed during the accounting period in which the good was purchased. However, in the case of a durable physical good, the consumer pays a particular price for the good on the understanding that it will yield welfare benefits (utility) during many accounting periods, therefore it is wrong to count the sale price as a close approximation of the welfare benefits (utility) enjoyed only in the year of purchase (i.e., as if no welfare benefits are enjoyed in the years between the purchase of the good and its eventual destruction). Lawn (2006:443), therefore states that if one accepts the Fisherian concept of income, the impact on measured national income is that any durable producer or consumer goods manufactured during the current year must be omitted from this year's income because it constitutes a current addition to the stock of human-made capital that is expected to yield a flow of welfare benefits (services/utility) in future years. Only the services rendered (utility gained) in the current year from the consumption of non-durable goods and by the depreciation of previously accumulated durable goods can be counted as part of this year's income.

Talberth *et al.,* (2006:3-4) state that Fisherian income also recognizes that the economic process involves many dis-services (dis-utilities)[24], therefore welfare does not always improve with increasing levels of consumption. Talberth *et al.,* (2006:3-4) state that because of these dis-services the concept of "psychic" income should be considered in a net sense, whereby national income measures that are based on the Fisherian definition do not measure total but net "psychic" income, which deducts the harmful aspects of consumption (i.e dis-utilities) from its welfare enhancing aspects.

Lawn (2006:444) therefore states that the fundamental difference between the two definitions lie in the fact that Hicksian national income counts all additions to human-made capital as

[24] These dis-services include human made capital depreciation and natural resource capital depletion costs.

current income, thereby wrongly conflating the services rendered by capital (income in the Fisherian sense) with the capital that renders them. In addition, Lawn (2006:444) states that an increase in a nation's "psychic" income is independent of an increase in Hicksian national income, because a nation's "psychic" income is partially determined, by the quantity of human-made capital (at least up to a certain amount), the quality of the stock, and its ownership distribution. Thus, the quality of stock and income distribution can be positively adjusted without the need for an increased rate of production and consumption. Lawn (2008:61) therefore adds that, in view of Fisher's (1906) emphasis on "psychic" services, Fisherian income diverges significantly from Hicksian income insofar as Fisherian income focuses on additions to the current accounting period, however, if net investment in capital is positive, Hicksian income also takes into account future consumption.

Harris (2007:7) states that these alternative views of income are very similar since both Hicksian and Fisherian income are consumption-based measures of sustainability. However, Harris (2007:7) asserts that as much as they are similar, Hicksian income is a better measure for evaluating sustainability; given that Fisherian income focuses only on present income while Hicksian income is concerned with both present and future income. Lawn (2008:73) however, states that since Hicksian income, is based on the quantity of goods consumed irrespective of their content and genuine contribution to human well-being (utility) and since there is little correlation between the quantity of goods consumed and the "psychic" income generated, the Hicksian concept of income is product-based and is not a better sustainability measure than Fisherian income.

4.5 EVALUATION

4.5.1 National Accounts (GDP) and Sustainable Development Theory

Sadoff (1992:21) states that capital depreciation is the most commonly imputed measure in the national income accounts. The Net National Product (NNP) is GNP less capital depreciation. Likewise Net Domestic Product (NDP) is defined as GDP less capital depreciation. Sadoff (1992:21) mentions that depreciation does not reflect an economic transaction, but is imputed to capture the declining income-generating potential of an asset

over time. Therefore allowances for capital consumption reveal the level of investment necessary for a country to maintain its productive capacity.

Therefore, Sadoff (1992:21) mentions that in order to measure income in a Hicksian sense, depreciation must be deducted from total income generated (from both human-made and natural capital). Sadoff (1992:21) states that, however, in the National Accounts framework, depreciation is only imputed and deducted for reproducible human-made capital and no analogous depreciation is imputed for natural capital. Sadoff (1992:21) states that this omission by the National Accounts framework has a particularly adverse impact on developing countries which rely heavily on resource-related industries since the exploitation of resources and degradation of the environment weakens these countries productive capacity. Sadoff (1992:21) therefore states that if the depletion of natural capital weakens the productive capacity of a country in the same way as the depletion of human-made capital, there seems to be no justification for imputing depreciation in one case but not in the other. Lawn (2005:4) states that, in addition to the National accounts framework not adequately accounting for natural capital depletion, the measure also adds a range of regrettable defensive and rehabilitative expenditures[25] in its calculation while omitting some beneficial activities such as non-paid household and volunteer labour. Therefore it can never be considered as a Hicksian measure and, more importantly, a measure of sustainable development.

In defence of the National Accounts framework, Bos (1997:184) states that Hicks (1946) fully realized that his concept of income was merely a theoretical construct; therefore it is hardly surprising that the income concepts actually used in the national accounts differ in many respects from Hicksian income. In contrast to Hicksian income, the national accounts focus mainly on describing the revenues and expenditure during the accounting period and ignore expected revenues and expenditure. Bos (1997:184) mentions that this is also the fundamental reason why the national accounts has adopted the current exchange value rather than the net present value as its basic principle of valuation. Bos (1997: 185) concludes by stating that Hicksian and Fisherian income are pure and abstract notions which are useful in theorizing but are not suitable for the measurement of complex economies. Schepelmann *et al.,* (2010:13) also states that the SNA does not conform to either the Hicksian or the

[25]These include private expenditures on health, car accidents and personal pollution control.

Fisherian definitions of income because its function does not fall within the realm of welfare and sustainability related measurements. Therefore with the foregoing discussion one can conclude that national accounts measures, including GDP do not conform to both Hicksian and Fisherian income and does not measure sustainability.

4.5.2 ISEW and Sustainable Development Theory.

As mentioned before, authors such as Nuemayer (2000) have criticised the ISEW and stated that it lacked theoretical foundations and therefore was not consistent with either the Hicksian and Fisherian income definitions. However, considering the ISEW construction method, Stockhammer *et al.,* (1997:22), state that ISEW follows the Hicksian definition of income. Harris (2007:10) disagrees with this notion and states that the ISEW is not useful in determining what might happen to consumption in the future because it ignores the impact of current activities on utility-generating capital. In response to Harris (2007) contention, Lawn (2008:63) states that ecological economists believe that natural capital and human-made capital are complements and not substitutes (Daly, 1996; Lawn, 1999 and 2004). Therefore, natural capital, along with human-made capital, must be kept intact to sustain the net "psychic" income generated by the economic process. Lawn (2008:63) therefore, states that since the cost of lost natural capital services is effectively equal to the cost of natural capital depletion, subtracting the former when calculating the ISEW means at least some of the impact of present activities on future well-being is being accounted for. Therefore, it is incorrect to say that the ISEW is not useful in determining what might happen to future welfare possibilities.

On the same tone, Talberth *et al.,* (2006:4-5) mention that although the ISEW has components that are used in calculating both Hicksian and Fisherian income, the measure falls more within the Fisherian definition of income. Talberth *et al.,* (2006:4-5) state that this is because it attempts to measure the net "psychic" income households derive from their consumption activities. However, it only counts the portion of Fisherian income that is sustainable, or derived from stable or increasing stocks of human-made and natural capital. However, Talberth *et al.,* (2006:4-5), acknowledge that while Fisherian income is a more accurate measure of income than GDP or Hicksian-based measures, the methodological objectivity of Fisherian measures such as the ISEW is necessarily much less clear because they require subjective judgments over what does and does not constitute welfare (utility)-

enhancing forms of consumption, what costs and benefits are added or deducted from such consumption, and how these costs and benefits ought to be measured.

Lawn (2003:112) states that the ISEW serves as very good measure for assessing sustainability precisely because it is consistent with the Fisherian concept of income and capital. Lawn (2003:112) mentions that this can confirmed by simply comparing the ISEW components with the Fisherian definition[26]. Lawn (2003:112) mentions that the ISEW's construction beginning with personal consumption expenditure is important because it provides an approximate estimate of what Fisher (1906) described as the services or "psychic" income enjoyed by the ultimate consumers of human-made goods. Lawn (2003:112) states that using consumption expenditure as the initial reference point does not imply that consumption is itself good, however, it implies that consumption expenditure is a 'necessary evil'. That is, it is necessary to consume goods to gain the services they yield. In addition, Lawn (2003:112) mentions that, if the same level of utility could be enjoyed from less consumption, this would be a gain because it would require less production to maintain the stock of human-made capital intact. Such a gain, if it were made, would not be reflected in this particular item but would instead be reflected in other items due to a smaller cost of pollution or resource depletion or both. Thus, if a given level of utility from consumption was accompanied by a reduction in the rate of production (due, for example, to an increase in the durability of human-made capital), this would lead to a rise in the ISEW and GPI.

The second component that Lawn (2003:112) thinks confirms that the ISEW falls within Fisherian income is the distribution of income component. Lawn (2003:112) mentions that the distribution of income can have a significant impact on a nation's economic welfare. For example, if personal consumption expenditure remained constant but the distribution of income deteriorated, the economic welfare enjoyed by society as a whole is likely to fall. Dietz and Nuemayer (2006:189) state that this is because of the notion that extra money is of greater marginal utility to the poor than to the rich. Therefore unless personal consumption expenditure is weighted according to changes in the distribution of income and the appropriate adjustment is made in the calculation of the ISEW, personal consumption expenditure would show an inaccurate reflection of its true contribution to a nation's economic welfare.

[26] See EQ 1.

Lawn (2003:112) also states that included in personal consumption expenditure is the amount paid in the current year on consumer durables such as cars and household furniture. Lawn (2003:112) mentions that in the calculation of the ISEW and GPI, the cost of consumer durables is subtracted from weighted personal consumption expenditure since the amount constitutes an addition to the stock of human-made capital therefore it does not constitute current income in the Fisherian sense. However, the value of the services annually yielded by previously purchased consumer durables is not included in personal consumption expenditure but rather is added to the running total of the ISEW.

Lawn (2003:113) mentions that consumer durables are not the only form of human-made capital that yields services. Publicly provided human-made capital such as libraries, museums, roads and highways also yield services. To be consistent with the Fisherian concept of income and capital, these services are treated as income and added in the calculation of the ISEW and GPI. However, also to be consistent with the Fisherian concept, current expenditure by governments on human-made capital is not included because it merely constitutes a current addition to the stock.

Dietz and Nuemayer (2006:189) mentions that since personal consumption expenditure overlooks the services provided by volunteer and non-paid household work (i.e. non-market activity), to obtain a better measure of the "psychic" income, the ISEW estimates the value of these services, which is also added to the measure.

As mentioned before, Talberth *et al.,* (2006:3-4) state that the economic process involves a range of dis-services which generate many repercussions. Therefore to extend the concept of "psychic" income to that of net "psychic" income, the cost of these disservices must also be included. To be consistent with Fisherian income the ISEW also deducts these dis-services in its calculation. These dis-utilities include the cost of noise pollution, the cost of commuting, the cost of crime, the cost of underemployment, in some cases, the cost of unemployment and the cost of lost leisure time.

Lawn (2003:113) states that a large portion of the human-made capital produced each year does not contribute to the "psychic" income of a nation. It is produced to prevent the undesirable side-effects of the economic process, thus, reducing the "psychic" income enjoyed in the future. Thus defensive and rehabilitative expenditures are subtracted from the

running total of the ISEW calculation. These expenditures include the cost of household pollution abatement, the cost of vehicle accidents and the cost of family breakdown.

Lawn (2003:113) states that the inclusion of 'Net capital growth' in the calculation of the ISEW is a contentious issue because, as one has mentioned, one of the key implications of the Fisherian concept of income and capital is that not all additions to the stock of human-made capital can be counted in current income. However, Lawn (2003:113-114) states that net capital growth is calculated as the increase in the stock of producer goods above the amount required to keep the quantity of producer goods per worker intact. The justification given by Lawn (2003:114) for its inclusion is that because human-made and natural capital are complimentary 'assets', sustainable economic welfare requires both forms of capital to be non-declining. In terms of human-made capital, this implies that the quantity of producer goods per worker must not fall. Therefore, should the stock of producer goods be greater than the necessary minimum requirement, the difference constitutes an increase in a nation's productive capacity, which is considered beneficial. Lawn (2003:114) states that net foreign lending/borrowing is also included in the ISEW calculation because a nation's long term capacity to sustain the "psychic" income generated by the economic process depends very much on whether natural and human-made capital is domestically or foreign owned. Lawn (2003:114) mentions that many countries with large foreign debts find it difficult to maintain the investment levels needed to keep their stock of human-made capital intact. Dietz and Nuemayer (2006:189) also mention that consumer expenditure financed by international debt is unlikely to be sustainable**.** Dietz and Neumayer (2006:189) add that, growth in capital and net foreign lending/borrowing, are added in the ISEW, specifically, because the ISEW is concerned not only with welfare but also with sustainability.

Lawn (2003:114) mentions that the cost of sacrificed natural capital services is incurred by way of the natural capital services lost in obtaining the throughput required to keep the stock of human-made capital intact. Thus, to be consistent with the Fisherian concept of income and capital, it was necessary to deduct the cost of the lost services provided by natural capital. Dietz and Neumayer (2006:189) mention that this is achieved by deducting, firstly, the costs of environmental degradation which includes issues such as air pollution, water pollution, ozone layer depletion and the long-term environmental damage resulting from climate change. Secondly, there is also the deduction of variables such as the depreciation of natural

resources, including non-renewable mineral and fossil fuel resources, the loss of natural habitats such as wetlands and the loss of farmland.

Given the reasons mentioned above, Lawn (2003:114) states that the ISEW is a superior indicator of both income and sustainable economic welfare than GDP or any Hicksian income based measures. However despite this, Lawn (2003:114) suggests that a theoretical weakness associated with the ISEW is that the index merely counts the cost of lost natural capital services without identifying the extent to which a nation's stock of natural capital has declined to such an extent as to render the economic welfare it enjoys ecologically unsustainable. Lawn (2003:114) notes that the ISEW, GPI, and other Hicksian measures do not directly provide this information and thus require supplementation. Nourry (2008:447) also agrees with this idea and adds that that the ISEW is not strictly an indicator of sustainable economic welfare since the incorporation of the cost of environmental degradation is not sufficient to indicate sustainability or otherwise, therefore in this context, a rise of the ISEW means that national economic welfare is improving and not necessarily sustainable. Therefore, at best policy recommendations should ensure that the ISEW/GPI is not decreasing.

Given the foregoing discussion with regards to the ISEW, one can at least agree with the notion that the ISEW is a measure of Fisherian income, in addition, one can add that it is partially an indicator of sustainable development and, as such, a better assessor of sustainability than national accounts measures such as GDP.

4.5.3 GS and Sustainable Development Theory

As mentioned before, the GS measure is essentially counted by subtracting net depreciation of natural capital from net investment in produced capital and finally adding investment in human capital[27] (Dietz and Neumayer, 2004:277). Ykhanbai and Bat (2010:33) state that the GS shows the real quantity of savings which is reserved for future generation and it becomes an important indicator for measuring sustainable economic development levels. As mentioned before, Nourry (2008:444) states that Genuine Savings (GS) stems from a theoretical model of maximization of a social welfare function, discounted at a constant rate,

[27]This is equivalent to EQ 2.

under hypothesis of constant population and perfect substitution between all kinds of capital (thus *weak* form sustainability[28]). Hanley *et al.,* (1999:58) states that since the GS measure assumes perfect substitutability between all kinds of capital, it is essentially an extension of the "Hartwick Rule". The "Hartwick Rule" requires that rents from natural resource extraction be re-invested in human-made capital to keep the total amount of capital (natural plus human-made) from declining. The measure therefore tests whether a country is following the "Hartwick Rule" by comparing the national savings rate with the sum of depreciation on natural and man-made capital, all expressed as a fraction of national income.

Hamilton (2002:1) states that if the "Hartwick Rule" is followed, so that investment in produced capital just equals current scarcity rents on the exhaustible resource at each point in time, then the resulting path for the economy is one where welfare equals a maximal constant value *ad infinitum,* in other words, the economy is sustainable. Jackson and McBride (2005) therefore state that the GS is an obvious extension of the Hicksian approach since it follows the "Hartwick Rule". However since GS is a *weak* form sustainability measure it does not fall within Fisherian income.

However, despite this, authors such as Asheim *et al.,* (2003:136) and Pezzey and Toman (2002:7) argue that the "Hartwick Rule" is not a measure of sustainability as not all external effects are internalized and thus resource productivity is not represented appropriately in the measure. The authors also show that sustainability in the sense of the "Hartwick Rule" is not at all sustainable in practice. Nourry (2008:444) explains this notion by stating that the theoretical model of the GS supposes that the economy follows an efficient growth path. Therefore, prices used in the GS computation must be optimal and sustainable prices. However, only current prices are available for empirical work and these prices are neither optimal nor sustainable, therefore since empirical values of GS are estimated with inaccurate data, conclusions on national sustainability based on this indicator must be used with caution.

Other authors have also mentioned that the GS excludes certain environmental factors such as bio-diversity and soil degredation although these matters are important in assessing national sustainability. In addition, Hanley *et al.,* (1999:59) state that *weak* sustainability in the context of the GS is a very narrow conception of what sustainability means, for example, the

[28]Pearce *et al.,* (1989) took the sustainability argument one step further by positing the concept of *strong* sustainability which assumes non-substitutability between all assets.

measure pays no attention to intra-generational fairness in the distribution of income, unlike other alternative objective measures. Therefore one can conclude that GS measure seems to be a partial indicator of *weak* sustainability, thus, at best, it only partially conforms to Hicksian income and fails to be consistent with the Fisherian definition.

4.5.4 HDI and Sustainable Development Theory

It has been mentioned before that there is no definite definition of sustainable development. However, consistent with Talberth *et al.,* (2006) and Turner *et al.,* (2002) and the WECD (1987) definitions, Dasgupta (2007:4) states that an economy's productive base will shrink if its stock of capital assets depreciates, and its institutions are unable to compensate for that depreciation. Additionally and in the context of this definition, Dasgupta (2007:4) states that the HDI is quite similar to GDP with regards to dealing with sustainable development because like GDP the HDI omits important environmental factors in its construction, therefore making it possible for a country's HDI value to increase while its productive base (i.e. natural capital) shrinks, thus giving misleading signals with regards to the long term sustainable development of a country.

Given the above mentioned issues and definitions,one can conclude that the HDI is not consistent with either the Hicksian or Fisherian definitions of income. However, it is worth mentioning that the HDI does attempt to satisfy some of Talberth (2006) sustainability principles in its construction. For example, the economic principle is represented by real GDP per capita while the social principle is represented by life expectancy and educational attainment. The main shortcoming of the HDI, however, is that it does not encompass the environmental principle and as a consequence fails to satisfy the meta-principle, whereby, social, environmental and economic needs must be met in balance in order to achieve sustainable outcomes in the long run[29]. Authors such as Sagar and Najam (1998) Neumayer (2001),Vega and Urrutia (2001) and Costantini and Monni (2005) have also criticised the HDI on precisely this point, stating that natural resource capital and other social variables should also be included in the construction of HDI and should be acknowledged as a major contributing factors in attaining sustainable development.

[29]It is assumed that if the HDI is not consistent with the Talberth *et al.,* (2006) principles, then it is also not consistent with Haughton (1999) five principles of sustainability.

Therefore, in summary one can conclude that the HDI does not conform to either the Hicksian and Fisherian definitions of income and is also not a measure of sustainability.

4.6 CONCLUSION

This chapter provided an evaluation of the National Accounts and alternative objective measures against Sustainable Development theory. A detailed description of the concepts of Sustainable Development (SD), Hicksian and Fisherian definitions of income was presented and the concepts were subsequently used to evaluate the National Accounts and alternative objective measures.

The National Accounts were the first measure to be evaluated against SD theory. It was concluded that the National accounts did not to conform to either the Hicksian or the Fisherian definitions of income, thus could not be viewed as a measure of sustainability.

The second measure that was evaluated was the ISEW. The ISEW was found to conform to both the Hicksian and Fisherian definitions of income, however it was concluded that it was more in line with Fisherian income. It was also concluded that the ISEW was a partial indicator of sustainability since the measure does not directly provide information regarding sustainability.

After an evaluation of the GS measure it was concluded that the GS measure conformed to the Hicksian definition but did not conform to the Fisherian definition. In terms of overall sustainability it was argued that since the GS is a measure of *weak* sustainability and is also restricted in terms of the scope of sustainability enabling factors it considered, the GS is at best, a partial indicator of *weak* sustainability.

The last evaluation involved the HDI. It was concluded that the HDI did not conform to either the Hicksian or the Fisherian definitions of income. It was also argued that the HDI was similar to GDP, since it also ignored important environmental and social factors that are important in assessing sustainability. Therefore it was concluded that the HDI was also not a measure of sustainability.

CHAPTER FIVE

CONCLUSIONS

5.1 SUMMARY OF MAJOR FINDINGS

The aim of this study was to provide an analysis of the alternative objective measures of economic performance and social development. To achieve the objectives of the research, a survey of the literature pertaining to the objective measures of socio-economic development was conducted. The alternative measures that were chosen to be analysed were the Index of Sustainable Economic Welfare (ISEW), the Genuine Savings (GS), and the United Nations Human Development Index (HDI). Chapter one of the study set out the goals of the research and briefly introduced the measures, including certain theoretical and methodological issues that arise with these measures.

Chapter Two provided a background of the national accounts framework as a measure of economic performance and social development. The evolution of the System of National Accounts (SNA) was discussed, including its most prominent component, GDP. Theoretical issues regarding the SNA were highlighted. Within this context, Sustainable Development concepts of Hicksian and Fisherian definitions of national income were also briefly introduced. Chapter two also highlighted some perceived benefits and deficiencies related to the SNA framework. The main perceived benefits of the SNA framework that were found was that the framework was still a valuable economic tool in terms of capturing data on market activity and monetary transactions in the economy, it belongs within an internationally standardized accounting framework and it is a concept which is still widely recognized and used. However the main deficiencies of GDP were found to emanate from the notion that it does not distinguish between economic activities that improve social and economic development and those that impair it, furthermore it also omits the measurement of social, economic and environmental sustainability. These deficiencies were thus some of the reasons why alternative objective measures were proposed.

Chapter Three of this study provided a comprehensive discussion of the alternative objective measures of economic performance and social development. The first alternative measure

that was discussed was the Index of Sustainable Economic Welfare (ISEW)/Genuine Progress Indicator (GPI). It was shown that the ISEW is an adjusted indicator which attempts to provide a more robust measure for assessing sustainability by addressing a series of deficiencies inherent to the National Accounts framework. The measure makes deductions from personal consumption to account for income inequality, costs of crime, environmental degradation, and loss of leisure and makes additions to account for the services from consumer durables and public infrastructure as well as the benefits of volunteering and housework. The notion behind the measure is that if ISEW is stable or increasing in a given year the implication is that stocks of natural and social capital on which all goods and services flows depend will be at least as great for the next generation while if ISEW is falling it implies that the economic system is eroding those stocks and limiting the next generation's prospects. Despite this criticism regarding the ISEW has mainly revolved around its construction, particularly with regards to the arbitrariness in the selection of components and methods used in assigning monetary values to these components. Other authors have also questioned the ISEWs theoretical foundations. The empirical literature review of the ISEW did indeed reveal that the methods employed by ISEW studies undertaken over the years has been quite inconsistent and subjective in terms of calculating some ISEW components such as environmental degradation and depletion. However, despite differences in methods and criticisms, most studies found that the ISEW tracked GNP/GDP over a period of years and then at some point during the period began to diverge from the trend. The main reason for the divergence given by the different authors is that the divergence occurs due to negative social and environmental policies employed by the various countries that are detrimental to sustainability.

The second alternative objective measure that was reviewed in Chapter Three was the Genuine Savings (GS) measure. GS is essentially constructed by subtracting net depreciation of natural capital from net investment in produced capital and finally adding investment in human capital. The GS measure is also based on the "Hartwick Rule" which requires that rents from natural resource extraction be re-invested in human-made capital to keep the total amount of capital (natural plus human-made) from declining, therefore making the GS measure a measure of *weak* sustainability. By definition, the GS monitors the stock of capital that will be available for future generations in a country; therefore persistent positive GS values are supposed to be an indication of a sustainable development path while persistently

negative GS values indicate an unsustainable one. The main criticism of the measure was found to be with regards to notion that it was a *weak* sustainability measure. Most authors mentioned that *weak* sustainability was a very narrow view of what sustainability means, and therefore needed to be expanded in order to incorporate additional environmental and social variables that are important when assessing national sustainability. The outcome of the survey of empirical literature was that low or negative GS values occurred for countries which were highly dependent on natural resources and had low extraction to savings ratios. It was also found that some authors found that low/ negative GS values were prevalent in low income countries.

The last measure reviewed in Chapter Three was the HDI. The HDI aggregates GDP per capita, life expectancy at birth, adult literacy rate, combined primary, secondary, and tertiary gross enrolment ratios with the primary intention of measuring human development. After this aggregation, HDI values for each country is ranked and placed within a league table. The lack of consistency in the HDI was criticised by authors, including suggestions that the measure could be redundant because of the high correlation between itself and its components and amongst the components themselves. However the main criticism of the HDI was with regards to the HDI's omission of natural capital in its assessment of human development. Due to these criticisms, proposals to expand the scope of the HDI were put forward. These were discussed in the empirical literature review and included modifications such as a pollution-sensitive HDI (HDPI) and a sustainable HDI (SHDI). The results found in the empirical literature showed that the introduction of additional variables in the HDI framework, especially environmental factors, resulted in major changes in countries' HDI rankings, with more industrialised and resource-dependent countries falling in the rankings, while those countries that employed environmentally friendly productive techniques climbing up the rankings.

Chapter Four contained an evaluation of the National Accounts and alternative objective measures against Sustainable Development Theory. The Sustainable Development Theory that was used to evaluate these measures was Hicksian and Fisherian income. Chapter Four also attempted to clarify the concepts of sustainable development, Hicksian income and Fisherian. The National Accounts were the first measure to be evaluated against SD theory. It was concluded that the National Accounts neither conforms to the Hicksian nor the Fisherian definitions of income, thus could not be viewed as a measure of sustainability. The second

measure that was evaluated was the ISEW. The ISEW was found to conform to both the Hicksian and Fisherian definitions of income, however it was concluded that it was more in line with Fisherian income. In terms of the ISEW being a measure of sustainability it was concluded that the ISEW/GPI is not strictly an indicator of sustainable economic welfare since the measure did not provide enough information regarding the sustainability or lack thereof of a nation. Therefore, at best, policy recommendations should ensure that the ISEW is not decreasing.

With regards to the GS measure it was found that the measure conformed to the Hicksian definition but did not conform to the Fisherian definition. In terms of overall sustainability it was argued that since the GS is a measure of *weak* sustainability and was also restricted in terms of the scope of sustainability enabling factors it takes into account (i.e. excludes certain environmental factors such as bio-diversity and soil degradation and social factors such as intra generational fairness in distribution of income), the GS was at best a partial indicator of *weak* sustainability.

The last evaluation in chapter Four involved the HDI. It was concluded that the HDI did not conform to either the Hicksian or the Fisherian definitions of income. It was concluded that the HDI did not conform to either the Hicksian or the Fisherian definitions of income. It was also argued that the HDI was similar to GDP, since it also ignored important environmental and social factors that are important in assessing sustainability. Therefore it was concluded that the HDI was also not a measure of sustainability.

In summary, this study demonstrates that despite the National Accounts and GDP's shortcomings as a measure of economic performance and social development at present there is no alternative approach[30]which succeeds in systematically overcoming all the shortcomings of the different measures mentioned in the paper. However, it is important to acknowledge that each of the considered alternative measures provided a much better approximation of social (sustainable) development than the National Accounts and GDP measure. It is also worth mentioning that ISEW (and GPI) are perhaps the best placed alternative measures in their attempt to overcome the multiple deficiencies of the National Accounts and GDP, as opposed to GS which focuses on corrections for environmental damage while ignoring important social factors and HDI which ignored environmental considerations.

[30] From the ones reviewed in this study.

5.2 IMPLICATIONS FOR THE MEASUREMENT OF ECONOMIC PERFORMANCE AND SOCIAL DEVELOPMENT

The issues raised by this study have important implications for the way that economic performance and social development is measured across time periods and across the world. The main implication of the results is with regards to policy recommendations that are formulated using common national measures such as GDP and HDI. As mentioned in the introduction of this research, there is an intricate relationship between goals, measures and actions.

As it has been shown, these more popular measures fail to encompass the fundamental aspects of sustainable development, therefore their results can be misleading in terms of assessing the present and future health of country's economies and social development, therefore the actions that are taken by country's policy makers which are informed by these measures can be detrimental in the long run. Therefore, there is a need for the clarification of the overall goals of societies in order to ensure that what is measured and the consequent actions that are taken are beneficial not only in terms of economic performance but also with regards to social development as well.

This study also reveals the need to formulate viable and practical alternatives which could supplement the existing National Accounts measures (i.e. GDP). In addition, the construction methods of these alternatives should be consistent in order to make them widely acceptable to the different stakeholders. As been mentioned, National Accounts measures such as GDP are, at present, regarded as primary means of measuring economic performance and social development because they were adopted by dominant international financial institutions such as the IMF and World Bank and were also widely accepted and supported by international political bodies such as the UN. Therefore in order for the alternative objective measures to also become widely accepted by the international community, a similar concerted political effort is required to bring these alternative measures to the fore and provide them with the necessary platform in order to be acknowledged as credible supplements or alternatives to traditional economic and social development measures.

5.3 RESEARCH PROSPECTS

As noted in the introduction, this research did not explore measures that included the large body of happiness/subjective literature; therefore since social development also includes the subjective happiness of individuals, future studies could combine objective with subjective measures.

It is also apparent that most ISEW studies undertaken were mostly European and North American and only a few were from developing economies. Therefore, future studies could expand the scope of the ISEW and construct ISEW's for other regions such as Asia and Africa, in particular South Africa in order to see if the ISEW pattern for these regions would be similar or consistent to the one exhibited in Europe and North America.

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APPENDICES

Appendix A

Table 1: COUNTRY, GDP, HDI and SHDI CHANGE IN RANK (1992-2002)

Rank	Country	SHDI value 2002	Δrank GDP 2002	Δrank HDI 2002	Δrank SHDI 1992	Δrank SHDI–SHDI-3 2002
1	Sweden	0.845	14	1	10	0
2	Norway	0.843	1	−1	0	0
3	Finland	0.834	11	0	0	3
4	United Kingdom	0.829	9	9	8	0
5	Austria	0.825	3	2	−4	2
6	Denmark	0.824	−2	6	1	−3
7	Slovenia	0.807	13	11	12	−2
8	Belgium	0.806	1	0	−4	5
9	Germany	0.802	1	5	−1	2
10	Portugal	0.799	8	10	3	−2
11	The Netherlands	0.794	−4	−1	−5	−1
12	Italy	0.793	0	3	−2	0
13	France	0.792	−2	−4	−8	1
14	Ireland	0.791	−12	−8	6	1
15	Switzerland	0.780	−10	−10	−6	−6
16	Greece	0.778	1	1	−1	1
17	Latvia	0.769	12	12	4	4
18	Estonia	0.767	7	8	4	−2
19	Poland	0.755	7	4	12	6
20	Hungary	0.748	3	4	8	−2
21	Spain	0.731	−5	−5	8	11
22	Lithuania	0.729	6	5	−5	−2
23	Malta	0.726	−2	−2	−5	0
24	Russian Federation	0.721	6	8	−8	−5
25	Czech Republic	0.715	−3	−3	0	−3
26	Cyprus	0.700	−7	−7	−3	0
27	Slovak Republic	0.682	−3	−2	3	4
28	Croatia	0.677	−1	0	−1	1
29	Bulgaria	0.675	2	1	−3	4
30	Romania	0.672	2	3	2	−3
31	Ukraine	0.660	4	3	−17	−7
32	Iceland	0.660	−26	−28	3	−4
33	Luxembourg	0.656	−32	−22	0	−3
34	Turkey	0.613	0	2	2	1
35	Albania	0.592	1	0	2	2
36	Macedonia	0.580	−3	−5	−2	−2
37	Moldova	0.556	0	0	−13	−1

Source: Costantini and Nonni (2005:345)

Table 2: COUNTRY GROUPS SHDI and COMPONENTS (1992-2002)

Country	1992					2002				
	SHDI	GNNP	EDU-S	SOC	ENV	SHDI	GNNP	EDU-S	SOC	ENV
Accession countries										
Cyprus	0.670	0.773	0.154	0.906	0.658	0.700	0.852	0.320	0.858	0.566
Czech Republic	0.658	0.725	0.182	0.860	0.685	0.715	0.812	0.421	0.750	0.737
Estonia	0.679	0.673	0.308	0.812	0.778	0.767	0.763	0.799	0.584	0.772
Hungary	0.646	0.705	0.189	0.647	0.738	0.748	0.791	0.551	0.772	0.749
Latvia	0.683	0.661	0.304	0.849	0.772	0.769	0.734	0.857	0.578	0.654
Lithuania	0.696	0.698	0.353	0.825	0.772	0.729	0.751	0.806	0.564	0.718
Malta	0.688	0.774	0.231	0.842	0.753	0.726	0.850	0.306	0.790	0.736
Poland	0.641	0.648	0.298	0.568	0.701	0.755	0.754	0.744	0.407	0.728
Slovak Republic	0.641	0.699	0.201	0.623	0.743	0.682	0.784	0.401	0.439	0.743
Slovenia	0.687	0.743	0.352	0.628	0.765	0.807	0.846	0.826	0.792	0.729
European Union (15 members)										
Austria	0.762	0.858	0.505	0.852	0.725	0.825	0.917	0.603	0.869	0.744
Belgium	0.750	0.857	0.580	0.773	0.580	0.806	0.915	0.748	0.780	0.594
Denmark	0.744	0.859	0.536	0.705	0.655	0.824	0.926	0.782	0.839	0.707
Finland	0.752	0.810	0.735	0.632	0.605	0.834	0.899	1.000	0.721	0.585
France	0.749	0.854	0.577	0.690	0.656	0.792	0.912	0.670	0.730	0.667
Germany	0.741	0.860	0.483	0.770	0.662	0.802	0.907	0.712	0.730	0.713
Greece	0.713	0.786	0.475	0.750	0.586	0.778	0.858	0.854	0.705	0.557
Ireland	0.684	0.788	0.434	0.546	0.506	0.791	0.929	0.624	0.843	0.571
Italy	0.728	0.848	0.455	0.647	0.690	0.793	0.904	0.664	0.723	0.746
Luxembourg	0.621	0.934	0.089	0.895	0.374	0.656	1.000	0.144	0.889	0.411
Netherlands	0.745	0.850	0.557	0.813	0.525	0.794	0.915	0.712	0.878	0.564
Portugal	0.724	0.772	0.382	0.828	0.779	0.799	0.838	0.663	0.814	0.766
Spain	0.643	0.802	0.510	0.472	0.431	0.731	0.869	0.736	0.659	0.475
Sweden	0.728	0.829	0.471	0.809	0.685	0.845	0.901	0.952	0.835	0.715
United Kingdom	0.725	0.833	0.486	0.692	0.624	0.829	0.911	0.795	0.822	0.657
OECD										
Iceland	0.590	0.851	0.339	0.848	0.088	0.660	0.923	0.682	0.885	0.021
Norway	0.758	0.874	0.630	0.799	0.557	0.843	0.947	0.926	0.861	0.553
Switzerland	0.731	0.850	0.361	0.886	0.701	0.780	0.937	0.555	0.895	0.705
Turkey	0.588	0.630	0.190	0.680	0.506	0.613	0.677	0.310	0.634	0.480
Transition economies										
Albania	0.571	0.438	0.092	0.645	0.806	0.592	0.631	0.203	0.334	0.646
Bulgaria	0.656	0.629	0.393	0.515	0.744	0.675	0.689	0.471	0.409	0.610
Croatia	0.652	0.652	0.321	0.516	0.784	0.677	0.749	0.455	0.532	0.712
Macedonia	0.608	0.650	0.210	0.261	0.827	0.580	0.673	0.338	0.269	0.680
Moldova	0.660	0.471	0.418	0.886	0.760	0.556	0.443	0.359	0.705	0.644
Romania	0.639	0.608	0.202	0.697	0.805	0.672	0.671	0.380	0.740	0.730
Russian Federation	0.701	0.644	0.584	0.766	0.689	0.721	0.640	0.872	0.656	0.689
Ukraine	0.716	0.636	0.544	0.900	0.715	0.660	0.575	0.725	0.611	0.740

Source: Costantini and Monni (2005:346)

APPENDIX B: SUMMARY OF MAIN LITERATURE

AUTHOR(S)	DATE	Hybrid = 2, Theoretical = 1, Empirical = 0	COUNTRY	PERIOD	AIM	MAIN FINDINGS/CONCLUSIONS
SNA						
SADOFF	1992	1	General	Not specified	Discussion of theory behind National Accounts framework	System of National Accounts (SNA), from which the GDP is derived, is theoretically neutral and does not correspond to either the Hicksian or Fisherian definition of income.
NORDHAUS	1995	1	General	Not specified	Discussion of theory behind National Accounts framework	Modern national-income accounting is based on the Hicksian definition of income which is useful for measuring current production but it has no obvious welfare (utility) significance.
UN	2003	1	General	Not specified	Description of the National Accounts framework	National accounts framework primary uses, include analysis, forecasting, communication and decision-making. Secondary uses of SNA include serving as input for alternative descriptions and budgetary rules and being a source for research.

LAWN	2005	1	General	Not specified	Analysis of National Accounts framework	National accounts framework is a poor measure of national income and is an inadequate indicator of sustainable economic welfare due to its omission of important environmental and social variables. Therefore the replacement of GDP by alternative indicators of national income, welfare, and environmental pressure is recommended.
BOS	2009	1	General	Not specified	Discussion of SNA framework.	SNA description of a national economy is closer in spirit to some economic theories (e.g. Keynesian theory, monetary analysis, input-output analysis) than to others (e.g. welfare economics and micro-economic theory).
GPI						
HAMILTON	1999	2	Australia	1950-1996	Application of GPI to Australia	It is found that from the 1950s there is a steady rise in GDP and GPI, however from the late 1970s the pattern changed markedly. In effect, the GPI does not increase at all from the late 1970s to 1996 while GDP continues to rise.
COSTANZA *et al.,*	2004	2	USA	1950-2000	Application of GPI to Vermont, Chittenden County and Burlington (USA) from 1950 to 2000.	All three Vermont scales were found to have had significantly higher GPI per capita since 1980 than the national average, indicating the major differences that can exist within a country. The GPI per capita for all Vermont scales was similar to the national average in the 1950–1980 period, but more than twice the national average by 2000.

VENETOULIS and COBB	2004	0	USA	1950-2002	Application of GPI to USA	GPI increased in line with GDP until the mid-1970s. From the high point in 1976, both indicators then declined steadily until a slight recovery in the late 1990s. However, GPI was lower than GDP throughout the period.
TALBERT,COBB and SLATTERY	2006	0	USA	1950-2004	Application of GPI to USA	GPI follows the GDP trend until the mid-1970s, and then it diverges from GDP trend and stagnates thereafter.
BAGSTAD and SHAMMIN	2009	0	USA	1950-2005	Application of GPI to State of Ohio, cities of Akron and Cleveland, and 17 Northeast Ohio counties	GPI per capita increased in eight counties but declined for nine counties, including Ohio, Akron and Cleveland. Per capita GPI was found to be greatest in suburban counties and lowest in urban areas, and was greater in Vermont than Ohio.
ISEW						
COBB and COBB	1994	0	USA	1950-1990	Application of ISEW to the USA	GDP in the United States increased substantially over the period, the ISEW began to level out, and even decline slightly from about the mid-1970s onwards.
MAX-NEEF	1995	1	General	Not specified	Discussion of threshold hypothesis	The Threshold Hypothesis states that for every society there seems to be a period in which economic growth (as measured by GNP/GDP growth) brings about an improvement in the quality of life, but only up to a point (the threshold point) beyond which, if there is more economic growth, quality of life may begin to deteriorate. The hypothesis is also assumed to be supported by ISEW and GPI findings.

ATKINSON	1995	1	UK	Not specified	Critique of the UK ISEW	UK ISEW is fundamentally flawed because of the high degree of arbitrariness in the method.
ROSENBERG and OEGEMA	1996	0	Netherlands	1950-1992	Application of ISEW to Netherlands	ISEW increased faster than GDP over the first three decades of the period, but declined quite sharply in the early 1980's. This result is unusual in comparison with most other studies, since the ISEW is above GDP at most stages of the period.
JACKSON and STYMNE	1996	0	Sweden	1950-1992	Application of ISEW to Sweden	Swedish ISEW followed GDP much more closely until the early 1980s. It then began to depart from GDP per capita over the last decade of the study.
STOCKHAMMER *et al.*	1997	0	Austria	1955-1992	Application of ISEW to Austria	A steady, widening gap between GDP and ISEW during the period was found.
JACKSON, LAING and McGILLIVRAY	1997	0	UK	1950-1996	Application of ISEW to the UK	UK ISEW exhibited a common trend to other studies, rising more or less in line with GDP until the mid-1970s and then diverging from the GDP trend, thereafter.
GUENNO and TIEZZI	1998	0	Italy	1960-1990	Application of ISEW to Italy	ISEW grew more slowly over most of the period and as a result there is a growing gap between ISEW and GDP. However, this study is uncharacteristic of the other ISEW studies, because there is no clear turning point at which the ISEW begins to stabilise or decline.
CASTANEDA	1999	0	Chile	1965-1995	Application of ISEW to Chile	ISEW grew at a slower rate than GDP, it was also found that even though GDP almost doubled during the last twelve years of the study, the ISEW did not follow suit.
HANLEY *et al.*	1999	0	Scotland	1980-1993	Application of ISEW and GPI to Scotland	Whilst GDP was rising over the period, both ISEW and GPI were falling, but not as sharply as other studies.

MATTHEWS *et al.*	2003	0	Wales	1990-2000	Application of ISEW to Wales	The variation between ISEW per capita and GDP per capita was far less than the other studies. The results also showed that in the late 1990s the ISEW fell slightly whilst the trend in GDP per capita continued steadily upwards.
CLARKE and ISLAM	2005	0	Thailand	1975-1999	Application of the ISEW to Thailand	ISEW per capita increased at a slower rate than GDP per capita, however during the Asian crises (1996-1998) both the GDP and ISEW declined. However the ISEW failed to recover during the economic recovery period (1998 onwards).
PROCHOWICZ and SLESZYNSKI	2006	0	Poland	1990-2003	Application of the ISEW to Poland	The ISEW trend for the period was volatile; however it had lower values than GDP for the entire period.
BLEYS	2008	0	Belgium	1970-2004	Application of ISEW to Belgium	ISEW increased over the entire study period. However it was still lower than GDP.
NOURRY	2008	0	France	1990-2000	Application of ISEW and GPI to France	ISEW and GPI per capita had lower values than GDP per capita during the period. However, GPI per capita was also inferior to ISEW per capita in the period.
BECA and SANTOS	2010	0	USA	1950-2005	Application of ISEW to USA	ISEW had lower values than GDP but did not decline sharply, instead it stagnated.
PULSELLI, BRAVI and TIEZZI	2011	0	Italy, Tuscany	1971-2006	Application of ISEW to Tuscany, Italy.	Tuscany ISEW and GDP do not contradict other ISEW studies made for national and sub-national economies. In fact, the trend of ISEW increases more slowly than GDP.
GS						

BEKERMAN	1994	1	General	Not specified	Discussion of sustainability (*weak*) in the GS measure.	Notion of *weak* sustainability is redundant and illogical. Employing the concept of a 'constraint' is necessary, and logical, only if there is conflict between the 'constraint' and what one is trying to maximize. Since *weak* sustainability aims to maximize welfare, it makes no sense to employ the notion that 'welfare must not decline' as a constraint.
HAMILTON, ATKINSON and PEARCE	1997	1	General	Not specified	Discussion of GS as a measure of sustainability	GS is a robust measure of sustainability and is useful to policy-makers.
HANLEY et al.	1999	0	Scotland	1980-1994	Application of GS to Scotland	Negative GS values for Scotland over the period were found which meant it was largely unsustainable. However Scotland got positive GS values when there were low oil prices, high savings and/or when there were discoveries of offshore hydrocarbons.
HAMILTON and CLEMENS	1999	0	General	1970-1993	Regional and country-level calculations of GS	Sub-Saharan Africa, Latin America and the Caribbean regions had the worst GS values of all the regions. However the South Asia, East Asia/Pacific region and OECD countries had the better GS values for the entire period.
EVERET and WILKS	1999	1	General	Not specified	Discussion of GS as a measure of sustainability	GS improves measurement of sustainability by incorporating environmental considerations but it suffers from a flawed method. Therefore it should be used cautiously.

ATKINSON and HAMILTON	2003	0	General	1980-1995	Investigating the link between the "Resource Curse", growth and saving.	There is a strong correlation between countries that have suffered from the 'resource curse' and negative GS values. (i.e. "Resource Curse" occurs when a resource abundant country experiences negative growth and development, due to their over-dependence on the resource)
LIN and HOPE	2004	0	UK and TAIWAN	1970-1998	Application of the GS to the UK and Taiwan	The UK and Taiwan have positive GS rates during the period, with the United Kingdom registering lower ones than Taiwan. Therefore both the UK and Taiwan seem to be sustainable over the period.
WORLD BANK	2004	0	General	1980-2000	GS application in 140 countries.	OECD countries as well as East and South Asian countries had positive GS values during the period , whereas, many African nations and the Middle East had negative values
PILLARISETTI	2005	2	General	Not specified	Paper examines the conceptual and empirical characteristics and policy implications of the GS measure.	GS measure is conceptually and empirically imperfect and policy implications based on this measure are erroneous.
BROWN, ASAFU-ADJAYE, DRACA and STRATON	2005	0	Australia	1989-1999	Application of GS to Queensland, Australia.	Queensland's GS rate has decreased during the period, indicating a possible negative trend. The average GS rate for the period was lower than the equivalent estimate for Australia.
NOURRY	2008	0	France	1990-2002	Application of GS measure to France	Value of the French GS was positive for the entire period; therefore, France seems to be sustainable during the period.
DOSMAGAMBET	2009	0	Kazakhstan	1995-1996	Application of GS in Kazakhstan	Despite GDP growth, Kazakhstan had negative GS values for the period. Majority of oil producing countries (including Kazakhstan) had significantly lower GS compared to non-

						oil producing countries in the period.
FERREIRA and MORO	2010	0	Ireland	1995-2005	Application of GS to Ireland	Ireland GS values are negative during the period, indicating sustainability problems.
SATO and SAMARET	2008	2	General	Not specified	General discussion of GS method and application	Low GS values are prevalent in both low income and resource rich countries
HDI						
McGILLIVRAY	1991	2	General	Not specified	Assess the usefulness of the HDI measure	HDI is positively correlated with each of its component as a consequence, assessing inter-country development levels on any one of the variables yields similar results to those that the HDI index itself yields. The index also provides little additional information regarding inter-country development levels than GNP per capita, alone provides. Therefore the HDI is a redundant composite inter-country development indicator.
KELLEY	1991	1	General	Not specified	Review of the HDI	HDI contributes only modestly to providing new insights compared with the GNP and GDP.
VEGA and URRUTIA	2001	2	General	1993-1998	Application of Pollution sensitive HDI (HDPI) to 165 countries.	Countries that dropped in HDI rank due the introduction of pollution factor were found to be largely oil producing and industrial countries.
NEUMAYER	2001	0	General	Not specified	Assess the sustainability of 155 countries using the modified HDI	42 countries out of the 155 are potentially unsustainable. Common theme between these countries is that all of them had relatively low

						reserves to extraction ratios.
COOKE, BEAVON and McHARDY	2004	0	Canada	1981-2001	Modified HDI is used to compare the educational attainment, average annual income, and life expectancy of registered Indians against Non-Indian Canadian population.	Although the gap in overall HDI scores between these two populations declined somewhat during the period, large disparities remain. However, the gap in real average annual income widened during the period, particularly for Registered Indian males.
SAGAR and NAJAM	1998	1	General	Not specified	Review of the HDI	The index fails to capture the essence of the world it seeks to portray. In addition, the index focuses almost exclusively on national performance and ranking, but does not pay much attention to development from a global perspective. Therefore modifications are required to overcome these shortcomings.
CRAFTS	2002	0	General	1870-1999	Presentation of revised estimates for the HDI	HDI in most of today's less-developed countries exceeds that of Western Europe in 1870 and that the gaps in HDI between Western Europe and each of Africa, China and India were smaller in 1999 than in 1950. These outcomes have been heavily influenced by widespread gains in life expectancy.
CAHILL	2005	0	General	Not specified	Assess the usefulness of the HDI measure in terms of correlation.	HDI components were found to be so closely correlated with one another that indistinguishable alternative indexes could be created from the same components with very different weights. Therefore HDI is a redundant composite inter-country development indicator.

NOORBAKHSH	1998	2	General	Not specified	Assess the usefulness of the HDI measure in terms of correlation.	HDI components are not highly correlated with each other and the index itself was not highly correlated with any of its individual components. Therefore HDI is not a redundant measure.
MORSE	2003	2	General	Not specified	Application of HDI for a simplified sample of 114 countries using various methodologies employed by the UNDP.	Major deviations (negative and positive) from the original HDI rank occurred frequently when the different approaches where applied.
COSTANTINNI and MONNI	2005	1	General	Not specified	Application of a Sustainable HDI (SHDI), and comparison with original HDI.	The comparison between the measures revealed divergences (positive and negative) from the HDI ranking and the SHDI, with most of the divergence being caused by the modification of the components.
NOURRY	2008	0	1990-2000	France	Applied the Pollution sensitive HDI (HDPI) to France and comparison with original HDI results.	Both the French HDPI and original HDI values increased during the decade, however, the value of the French HDPI was found to be less than that of the HDI.
NOURRY	2008	0	1990-2000	France	Applied the Sustainable HDI (SHDI) to France and compared it to original HDI and HDPI results.	Both the French SHDI and original HDI values increased during the period however, the value of the French SHDI was lower than that of the original HDI. It was also found that the gap between the French SHDI and the original HDI was also larger than the gap between the French HDPI and the original HDI over the same period.
ESCOSURA	2010	2	1870-2005	Not specified	Construction and application of an 'Improved HDI' (IHDI), also comparison between original HDI and IHDI.	When the IHDI and the original HDI were compared, an upward trend is confirmed, however, a widening absolute gap between the two measures was observed, with IHDI lagging behind.

GENERAL						
ENGLAND	1998	1	General	Not specified	Paper surveys a number of quantitative measures which have been proposed as complements to or substitutes for GDP	ISEW should be seen as a springboard for future research on national accounting and not as a completed framework filled with accurate data. HDI data provides only fragmentary evidence about the extent and sources of well-being within particular nations.
NEUMAYER	2000	1	General	Not specified	Review of the methodology of ISEW, GPI and related measures.	The ISEW/GPI does not provide evidence in support of “Threshold hypotheses". There is only a widening gap between ISEW/GPI and GNP, when it is artificially created via the introduction of the 3% cost escalation factor and the accumulation of long-term environmental damage.
LAWN	2003	1	General	Not specified	Attempt to find a theoretical foundation in support the Index of Sustainable Economic Welfare (ISEW), Genuine Progress Indicator (GPI), and other related indexes over GDP.	The ISEW and GPI serve as very good indicators of both income and sustainable economic welfare precisely because they are consistent with Fisher’s (1906) concept of income and capital. The Fisherian concept of income that is adopted in the construction of both the ISEW and GPI is far superior to the Hicksian definition.
BORINGHER and JOCHEM	2007	1	General	Not specified	Survey of the explanatory power of various sustainability indices (including ISEW and GS)	Sustainability indices reveal a high degree of arbitrariness and therefore fail to fulfil fundamental scientific requirements making them rather useless if not misleading with respect to policy advice.

SEN, STIGLITZ and FITOUSSI	2009	1	General	Not specified	Review of measures of economic performance and social progress.	GDP cannot be regarded as the sole indicator of economic performance and social progress. Social progress should not be measured from a purely material standpoint because it also depends on non-economic factors such as health, social ties, environmental conditions, the individual's subjective perceptions, etc. There is a need to develop indicators that would give a clearer view of these aspects. Economic performance and social progress also needs to be assessed in terms of sustainability. The environmental dimension is essential.
VAN den BERGH	2009	1	General	Not specified	Critical review of GDP and alternative measures.	GDP represents a serious information failure and suffers from many shortcomings. However all current alternatives also suffer from various shortcomings, even though most of them represent a clear improvement over GDP. Therefore dismissing GDP as an indicator to monitor economic progress and guide public policy will lead to public and private decisions that are more in line with improving human well-being.
COSTANZA	2009	1	General	Not specified	Discuss alternative measures of economic performance and social progress.	GDP's emphasis on economic quantity encourages depletion of social and natural capital and other policies that undermine quality of life for future generations and alternative measures can help to overcome this deficiency. However there is no perfect alternative to GDP.

SCHEPELMANN, GOOSENS and MAKIPAA	2010	1	General	Not specified	Survey of alternative progress indicators to GDP as a means towards sustainable development	All the different alternative measures (i.e. ISEW/GPI, GS and HDI) have unique advantages and disadvantages in both construction and application therefore each of the measures, including GDP should be used for specific purposes.