Draft Report of the Task Force for Measuring Sustainable Development

Draft under consideration
October 5th 2012

This is the first full draft of the Report that is being prepared by the Task Force for comments by the CES Bureau.

Progress reports have been previously presented to the Conference:

- In 2011 - "Executive Summary". Countries expressed support for the work and noted the good progress achieved. The consultation provided many useful ideas to improve the Report. The Conference "appreciated the progress made by the Task Force. It was stressed that the work should take into account other international initiatives in related areas. The final report should be a step forward towards harmonisation of the work in measuring sustainable development and not be considered as guidelines or a manual for official statistics." (Report of the CES 2011 plenary session ECE/CES/81).
- In 2012 - "Main messages" and "Short narrative". The CES provided comments and requested the Task Force to continue work on finalising the Report. (Report of the CES 2012 plenary session ECE/CES/83).

The attached draft Report includes:

- Main messages
- Short narrative
- Part I. Conceptual background
- Part II. Exploring the dimensions and themes of sustainable development
- Part III. Sustainable development indicators
- Part IV. The way forward
- Annexes: detailed information about various data and information that have been considered as a basis for the report

The Report is undergoing finalisation and final editing with the aim to be distributed for a large consultation with all CES members in spring 2013.

TABLE OF CONTENTS

MAIN MESSAGES

Why measure sustainable development?

1. There is widespread understanding that society needs a better statistical 'compass' to shift emphasis from measuring economic phenomena to measuring sustainable development. The latter concept entails making choices between using the resources to maximise current human well-being or preserving the resources for future use; or between maximising the human well-being of one country at the expense of others. In addition to prevalent macroeconomic indicators such as GDP, sustainable development indicators pays due attention to current human well-being, including its distribution across and within countries, as well as to the inter-generational aspects of human-well-being. The concept of sustainable development focuses, among other things, on the depletion of natural resources, climate change and other factors that affect society in the long run.

The need for harmonisation

2. The last two decades have seen a huge proliferation of methods and indicators to measure sustainable development. Many composite indicators have been proposed in the academic literature, while many institutes have adopted sets of sustainable development indicators (SDI) to track progress towards a sustainable society. While these initiatives have helped to put sustainable development on the agenda of national and international institutions, the differences in the approaches remain large. The Report therefore provides a conceptual framework that aims to harmonise the different ways in which sustainable development has been measured. The framework may serve as an organising principle to facilitate the users' choice through large numbers of indicators and to present the information in a concise manner. The Report is primarily aimed at statisticians. It may also be relevant for policy makers, since policy targets for sustainable development are increasingly being formulated at national and supranational levels.
3.

Proposed conceptual framework

4. The framework presented in the Report aims to link the SDI sets that are currently produced by national and international statistical organisations and formulate a list of potential indicators based on a sound conceptual framework.. As such, the framework could facilitate the comparison and harmonisation of existing SDI sets. A distinction is made between *three conceptual dimensions* of human well-being 'here and now', 'elsewhere' and 'later'. *Twenty themes* that cover environmental, social and economic aspects of sustainable development are distinguished in this Report. These are: subjective well-being, consumption and income, health, housing, education, leisure, physical safety, trust, institutions, energy resources, non-energy resources, land and ecosystems, water, air quality, climate, labour, physical capital, knowledge capital and financial capital.

Theoretical and practical foundations of the framework

5. The Report presents a measurement system which is based on the following sources:

   (a) *Brundtland report*. The Report builds on the definition of sustainable development which was provided in the Brundtland report, prepared by the United Nations World Commission on Environment and Development (WCED): "Sustainable development is a development which meets the needs of the present generation without compromising the ability of future generations to meet their needs". The Report also argues that sustainable development is essentially about distributional justice, both in

time and space. This means that the distribution of well-being between the present and future generations is included, as well as the difference in well-being between countries.

(b) *Economic theory, with additional insights from other social sciences*. The framework is developed on the basis of a thorough study of the available academic literature related to economic theory and measurement of capital. It builds on the notion of a production function which links human well-being to capital. The conceptual basis of the framework covers the economic, environmental, social and aspects of sustainable development.

(c) *Stiglitz-Sen-Fitoussi report and other international initiatives.* The Stiglitz-Sen-Fitoussi Report provided an important impetus to the issue of measuring sustainable development. The Report of the Task Force stays close to the recommendations made by Stiglitz et al. The work of Eurostat, OECD and international organisations related to measuring sustainable development has also been taken into account, work such as the European Commission Communication on "GDP and beyond", the recommendations of the EU Sponsorship Group on Measuring Progress, Well-being and Sustainable Development, and the OECD work on measuring and fostering the progress of societies, including the "Better Life" initiative.

(d) *The commonalities in existing SDI sets.* The Report uses a pragmatic approach in developing a SDI set based on the proposed conceptual framework. The themes and indicators are selected based on an in-depth analysis of the sustainable development themes and indicators that are currently used in several national and international datasets.

Trans-boundary impacts

6. In an increasingly globalised world, the relationships between countries become increasingly important. An important conclusion of the Report is that SDI sets should reflect the transboundary impacts of sustainable development, by highlighting how a country in the pursuit of the well-being of its citizens may affect the well-being of citizens of other countries.

Procedure to select three indicator sets of potential indicators

7. The Report proposes a procedure to derive three indicator sets, which are based on the measurement framework presented in the Report. The indicator sets include a large set of 60 indicators based on a conceptual organisation, which provides information about the well-being in the "here and now", "later" and "elsewhere"; a large set of 90 indicators based on a thematic organisation with more detailed indicators about policy drivers; and a small set of 24 potential indicators to communicate the main messages to policy makers and the general public more efficiently. The small set of indicators should be regarded as a possible way of narrowing down the number of indicators.The users may find also other ways to define a small dataset from the proposed large and comprehensive sets of potential indicators .

Relevance of the framework

8. The framework presented in the Report can be used in a flexible way – it links the three conceptual dimensions defined in the Brundtland report ('here and now', 'later' and 'elsewhere') to policy-relevant themes. The Report strives to harmonise the measurement of sustainable development based on a solid conceptual framework. It proposes an indicator set without claiming to provide a "one size fits all" solution. Though the proposed sustainability themes are universal, there is room for selecting country-specific indicators. The system also allows for the development of indicators which may provide information on how to reverse "negative" trends or to sustain "positive" ones from a sustainable development perspective.

Measuring sustainable development within the realm of official statistics

9. An important criterion when selecting the sustainable development indicators is whether they are in line with the quality standards of of official statistics. Official statistics entail any statistical activity carried out within a national statistical system, or under the statistical programme of an intergovernmental organisation. The majority of indicators presented in the Report are produced by national statistical offices and collected by international and supranational organisations such as the United Nations and Eurostat. This particularly applies to the small set of indicators selected on the basis of their availability in a great number of international datasets.

SHORT NARRATIVE

Introduction

10. The Report presents a broad conceptual framework for measuring sustainable development and suggests sustainable development indicators that can be used for international comparison. It is a step towards harmonising the various approaches and indicators that are used by countries and international organisations for measuring sustainable development. The Report takes into account existing approaches used by the various initiatives undertaken by United Nations, European Commission and the OECD, as well as initiatives of various individual countries. Examples include the European Commission's work on "GDP and beyond", the recommendations of the EU Sponsorship Group on Measuring Progress, Well-being and Sustainable Development, and the OECD work on measuring well-being and fostering the progress of societies, including the "Better Life Initiative".

11. The Report has been prepared by the Joint UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development (TFSD). It is a follow-up to the Working Group on Statistics for Sustainable Development (WGSSD), which published its report in 2009. The WGSSD focused mainly on the inter-generational issues of sustainable development using capital measures, while in addition the TFSD also takes the well-being of the current generation into account.

Conceptual background (Part I of the Report)

12. A starting point for this report is the definition presented in the Brundtland report (1987), which defined sustainable development as development that "*meets the needs of the present without compromising the ability of future generations to meet their needs*".

13. Furthermore, the Brundtland report puts emphasis on the fairness of societal developments on a global scale. In an increasingly globalised world, the measurement approaches should reflect the transboundary impact of sustainability, by highlighting how a country in the pursuit of well-being of its citizens may affect the well-being of citizens of other countries. Essentially, sustainable development deals with the inter- and intra-generational aspects of (the distribution of) human well-being.

14. Following the Brundtland definition, three dimensions of sustainable development are distinguished, i.e. human well-being of the present generation in one particular country (referred to as 'here and now'), the well-being of future generations ('later') and the well-being of people living in other countries ('elsewhere').

Dimensions and themes of sustainable development (Part II of the report)

15. Part II of the Report identifies which specific themes of sustainable development need to be measured for the three conceptual dimensions of human well-being, i.e. 'here and now', 'later' and 'elsewhere'.

Human well-being 'here and now'

16. There is no theoretical consensus on how to measure the human well-being of the present generation. Essentially, human well-being is determined by what people regard as important in their lives. This can be a mix of subjective and objective measures. The main themes are identified

in a pragmatic way. First, the various perspectives on measuring human well-being are discussed on the basis of an exploration of the academic literature. Second, a selection of themes is made based on a number of important empirical studies.

17. The measurement of human well-being 'here and now' distinguishes the following themes: subjective well-being, consumption and income, nutrition, health, labour, education, housing, leisure, physical safety, land and ecosystems, water, air quality, trust and institutions.

Human well-being 'later'

18. The well-being of future generations is dependent on the resources that the current generation leaves behind. The abundant literature on capital measurement, which is extensively discussed in the 2009 WGSSD publication, makes it relatively easy to distinguish the main themes of this dimension. The WGSSD agreed that the assets that should be preserved for future generations fall under four main types of capital: economic, natural, human and social capital. The measurement system estimates the current levels of capital and their increase/decrease to show how choices of the present generation might impact future generations; it does not aim to forecast the well-being levels that may be attained by future generations.

19. For economic capital as well as important parts of natural capital the choice is based on international standards such as the System of National Accounts (SNA) and the System of Economic and Environmental Accounts (SEEA). There are no international standards yet on the measurement of human and social capital.The Report reflects the current development in the research in the area. Human capital is defined as the quality of labour in terms of educational attainment and health status. Social capital encompasses the generalised trust that is being built through the repeated interactions between citizens. A second theme related to social capital concerns the quality of society's institutions.

20. Human well-being 'later' distinguishes the following themes: for economic capital - physical capital, knowledge capital and financial capital; for natural capital - energy resources, non-energy resources, land and ecosystems, water, air quality and climate; for human capital: labour, education and health, and for social capital: trust and institutions.

Human well-being 'elsewhere'

21. The 'elsewhere' dimension captures the ways in which countries affect the human well-being of the rest of the world. The transboundary impacts of a country may affect the other countries through various channels.An example are the indicators on the impact of developed countries on less developed countries (e.g. official development assistance). Another example is the extent to which one country may deplete the resources of other countries, i.e. the so-called footprint indicators. These indicators calculate the environmental pressures that are attributable to consumption in one country on resources abroad.

22. Human well-being 'elsewhere' distinguishes the following themes: consumption and income, energy resources, non-energy resources, land and ecosystems, water, climate, labour, physical capital, knowledge capital, financial capital and institutions.

Inequality

23. Inequality and distributional issues have a special importance for measuring sustainable development. Inequality is a cross-cutting issue relevant to most of the themes and indicators

included in a SDI set. Inequality may also be seen as an important driver of well-being, as the literature suggests that people's own well-being is strongly influenced by their position relative to a peer group. Therefore, the Report includes, wherever possible, a breakdown of indicators for different groups (e.g. gender, age, ethnic background, etc.).

Sustainable development indicators (Part III of the Report)

24. Part III of the Report focuses on selecting the three potential indicator sets that are proposed by the TFSD: two large sets of 60 and 90 indicators respectively, as well as a small set of 24 indicators. The presented indicators should be viewed as example indicators that were identified based on commonalities in different indicator sets and availability in international databases. The set can be considered by countries as a potential set of indicators that can be derived from the conceptual framework.

Two large indicator sets

25. There are two ways to structure a SDI set. The conceptual and thematic categorisation can be seen as complementary. It is possible to select and use just one of them, or both simultaneously in developing a set of indicators. In the Annex to this short narrative (SN) the indicators of the large set according to the conceptual categorisation (Table SN.Annex1) and the thematic categorisation (Table SN.Annex2) are presented.

26. The two categorisations are presented in Tables SN.Annex1 and SN.Annex2 of the annex to this short narrative:

(a) *Conceptual categorisation (Table SN.Annex1).* The conceptual categorisation presents a set of proposed indicators according to the dimensions 'here and now', 'later' and 'elsewhere'. The table shows how the themes identified in Part II of the Report are allocated according to these three conceptual dimensions (column 1). The last two columns present possible indicators: the fourth column presents aggregate indicators (these can be totals, average, mean, etc.) and the fifth column includes indicators showing the distribution among different groups of population. Table SN.Annex1 includes 60 indicators overall. Twelve indicators[1] appear in the table twice. For example, 'educational attainment' appears as an indicator for both the education component of human well-being and of the education component of human capital. The indicators presented are considered 'core' indicators for each theme as they indicate to what extent a country is on a sustainable path in that particular area;

(b) *Thematic categorisation (Table SN.Annex2).* In this categorisation, the SDI set is organised according to the twenty themes defined in Part II of the report. Table SN.Annex2 includes the same core indicators as in the conceptual categorisation (Table SN.Annex1). Here, they are no longer allocated along the dimensions 'here and now', 'later' and 'elsewhere'. For example, in the conceptual categorisation education is a theme for well-being 'here and now' and 'later'. In the thematic categorisation there is simply one theme, education. As in Table SN.Annex1, both aggregate indicators and indicators showing distribution are presented. Table SN. A2 includes 90 indicators. In addition to the "core" indicators listed in Table SN.Annex1, indicators for the so-called "policy drivers" are provided for each theme. These "policy driver" indicators show how society (and policy makers) can influence the core indicators. . In the case of education, for example, a "policy driver" indicator could be the "percentage of early school leavers".

[1] Life expectancy at birth, distribution-health, educational attainment, distribution-education, employment rate, female unemployment rate, youth unemployment rate, generalised trust, bridging social capital, voter turnout and number of women in parliament.

Monetisation

27. The Report discusses the issues related to monetisation of different types of capital and raises caution as monetisation is often based on strong assumptions. Even though such estimates can be very interesting for academic purposes, sometimes due to the underlying assumptions they are considered to be outside the realm of official statistics.

28. For presentation purposes, a coding system is used in both Tables SN.Annex1 and SN.Annex2. The following codes have been established: HWB refers to Human well-being; EC – Economic capital; NC – Natural capital; HC – Human capital; SC – Social capital; TI – Transboundary impacts; "M" is used to denote monetary capital indicators as distinct from physical indicators of capital. The light shaded areas denotes capital indicators expressed in physical terms and the dark shaded areas indicate capitak indicators expressed in monetary terms.

29. In Table SN.Annex2 the various indicators are also categorised according to the indicator typology used in this report. Firstly, there are the core indicators and their distribution: CORE-HW – Core indicator for human well-being; CORE-C – Core indicator for capital; CORE-TI – Core indicator for transboundary impacts; and DIST - Indicator showing distribution (inequality). Secondly, a variety of policy drivers can be identified: INV – Investment; DEPR – Depreciation or extraction; INT - Intensity indicators; PROD – Productivity indicator; OTHER – Other types of indicators.

Advantages and disadvantages of the two large sets

30. The advantage of the conceptual categorisation is that it emphasises the trade-offs between the 'here and now', 'elsewhere' and 'later'. It is also closely connected to economic theory and is therefore more amenable to economic modelling and to developing satellite accounts. The advantages of the thematic categorisation are that the terminology is more suited to the language and dimensions of the policy makers and the general public. In addition, the framework can easily incorporate indicators on the key "policy drivers" for each theme. The "policy drivers" are relevant to policy makers as they can provide them with more detailed information on how to reverse negative or sustain positive trends.

31. The Report does not aim to define a "one size fits all" approach, but rather presents a flexible framework that can cater to a variety of needs. Those users who want to stress the current as well as the future aspects of human well-being (the 'integrated approach') may base their indicator system on the twenty themes. Users who want to emphasise the inter-generational aspects of sustainable development (the 'future-oriented or 'capital approach') may restrict themselves to the use of capital indicators identified in Table SN.Annex1. Within the future-oriented approach, some users may prefer to use monetised capital indicators (the 'monetary capital approach') shown in the dark shaded areas in Table SN.Annex1. Others may opt for the 'hybrid capital approach' that uses both monetary and physical indicators of capital.

32. The different approaches for constructing a SDI set have been linked on the basis of the flexible framework presented in this report. The relationship between the conceptual and thematic categorisations is shown in Table SN.Annex3.

Selection procedure of two large indicator sets

33. The following three considerations have been taken into account in selecting the indicators included in the large set:

(a) *Indicators based on theoretical concepts that are most fitting to measure specific aspects of sustainable development.* These are referred to as "ideal indicators". The indicators are derived by taking into account the measurement literature although not all of them are currently available in practice. The choice of indicators is primarily based on conceptual grounds.

(b) *Indicators based on the analysis of commonalities in existing SDI sets.* These are indicators which are included in the majority of existing SDI sets. Annex I of the Report provides a detailed analysis of the indicators developed and used by United Nations, Eurostat and the World Bank as well as seven countries, members of the Task Force.

(c) *Analysis of the data availability in international databases.* The availability of the indicators was checked in the databases of the United Nations, the OECD and Eurostat.

34. There is a distinct hierarchy in the criteria. Since the indicators sets are conceptually driven, the "ideal indicators" is the most important criterion. It is followed by the "commonalities" criterion, i.e. the frequency with which an indicator is used in SDI sets.

Selection procedure of the small indicator set

35. A smaller set of indicators is needed to communicate more efficiently the main messages to policy maker and the general public. Table 1 proposes a small set of 24 indicators selected based on commonalities in existing SDI sets and data availability in the reviewed international databases. The indicators are allocated according to the 20 policy-relevant themes. They are derived from the 90 indicators of the large set (thematic categorisation).

Table 1. Sustainable development indicators: small set –thematic categorisation (24 indicators)

Theme	Indicator
Subjective well-being	Life satisfaction
Consumption and income	Final consumption expenditure
	Official Development Assistance (ODA)
	Imports from developing countries
	Income inequality
	Gender pay gap
Nutrition	Obesity prevalence
Health	Life expectancy at birth
Labour	Employment rate
Education	Educational attainment
Housing	Living without housing deprivation
Leisure	Leisure time
Physical safety	Death by assault/homicide rate
Land and ecosystems	Bird index
Water	Water abstractions
Air quality	Urban exposure to particulate matter
Climate	GHG-Emissions
Energy resources	Consumption
Non-energy resources	Domestic Material Consumption
Trust	Generalised trust
Institutions	Voter turnout
Physical capital	Gross capital formation

Knowledge capital	R&D expenditures
Financial capital	Government debt

Availability of data in existing international databases

36. The mandate of the Task Force included an analysis of the set of indicators from the point of view of data availability within official statistics. The availability of data for the selected indicators for the EU and the OECD member countries and the six so-called BRIICS countries (Brazil, Russia, India, Indonesia, China, and South Africa) in international databases was analysed. The purpose was to obtain a general estimate of how many of the proposed indicators are available within the databases of major international organisations.

37. Table 2 summarises to what extent the suggested indicators are available in the existing international databases. The indicators are divided into three categories: 1) data that are currently available in the databases of the United Nations and Eurostat, 2) data available from other sources such as the OECD and the European Social Survey, and 3) indicators as place-holders (i.e. indicators that are not yet available).

Table 2. Data availability of the indicators in the large and small sets

	Large set					**Small set**
	Conceptual categorisation				**Thematic categorisation**	**Thematic categorisation**
	Here and now	Later	Elsewhere	Total		
Available:	82%	65%	50%	68%	76%	100%
- databases UN/Eurostat	73%	42%	50%	55%	69%	92%
- Other (OECD/WB/ESS/NOAA. NASA)	9%	23%	0%	13%	7%	8%
Place-holders:	18%	35%	50%	32%	24%	0%
Official sources SEEA/SNA	73%	58%	50%	62%	80%	92%

38. A large part of the indicators in the large sets (55% and 69%) and almost all (92%) of the indicators in the small set are available in the United Nations and Eurostat databases.

39. If the data sources scope is broadened the availability is even greater. The sources include the OECD, World Bank, European Social Survey (ESS) as well as climate related (National Oceanic and Atmospheric Administration (NOAA) and the NASA).

40. The place-holders demonstrate a need for new indicators that statisticians can strive to develop in the future. Several of these place-holders are reserved to indicators that are expected to be developed as a result of application of the SNA and SEEA standards. Other place holders include footprint indicators as well as indicators related to inequality. As the small set of indicators is identified based on data availability, it does not include place holders.

Official statistics

41. Official statistics deal with any statistical activity carried out within a national statistical system, or under the statistical programme of an intergovernmental organisation. The availability of indicators in official statistical sources is important from the viewpoint of the quality standards of official statistics. The data that are available from outside official statistics are not necessarily of lower quality. Some of the data sources pay significant attention to quality and have strict

procedures to verify the data. However, their quality criteria may be different from those applied by NSOs and international organizations producing official statistics. Furthermore, the procedures of collecting, producing and disseminating data may also differ from official statistics. For example, there may be no obligation to protect data confidentiality, some stakeholders may have privileged access to the data, the independence and impartiality may not be guaranteed.

42. The analysis of the data availability shown in Table 2 is largely based on official international statistical sources. The results show that a large part of the indicators is available in the dataset of the United Nations and Eurostat or are covered by international guidelines such as the SNA and SEEA. With regard to the large set of indicators for the conceptual categorisation, 62% of the indicators could be considered within the realm of official statistics, and for the thematic categorisation - 80%.

43. The high availability of the suggested indicators shows that official statistics are already on a good path to measure sustainable development. However, there are areas in which further development of indicators is needed, as outlined below.

The Way Forward (Part IV of the Report)

44. Part IV of the Report outlines potential areas of future work: (i) measurement issues; (ii) the proper communication and visualisation of the data and (iii) the ways in which the outcomes of this Task Force may contribute the Post Rio+20 policy agenda.

Refining, extending and implementing the measurement system

45. In the report a number of areas is identified with respect to the measurement issues that are related to the refinement, extension and implementation of the measurement system proposed by the TFSD:

(a) *Developing harmonised indicator sets for measuring sustainable development.* There is a great need for national statistical agencies and international organisations to harmonise their SDI sets to be better suited for international comparison. This Report may serve as a basis for further harmonisation.

(b) *Transboundary impacts.* More work needs to be done on measuring the international aspects of societal development. Apart from the environmental aspects and the impact of affluent countries on developing countries, the social and economic inter-relationships between countries should be part of any measurement system on sustainable development.

(c) *Further work on specific topics.* More work needs to be done to arrive at better indicators in some fields:

- Human, social and natural capital. The measurement of these capital stocks and the wider availability of these indicators need to be stimulated.
- Distribution. Income inequality measures need to be improved and augmented by comparable statistics in the area of health, education and other themes.
- Time use. More use can be made of information on time-use in order to measure non-market activities which are relevant to sustainable development (especially in the field of human and social capital).

(d) *Linking subjective and objective indicators.* More work needs to be done to link subjective (perception) indicators on human well-being to objective measures of living conditions (i.e. measure of the prevalence of disabilities and chronic illness) to the ways in which people perceive their health conditions, etc.

(e) *Measuring sustainable development at different scale levels*. Attempts should be made to measure sustainable development at other levels, i.e. local and regional levels but also at the enterprise level (Corporate Social Responsibility) and household level.

Communication and visualisation

Building SDI sets is one thing, but a proper communication of the data to a broad audience is of crucial. The last part of the Report reflects on the issues of communication and visualisation.

Post Rio+20 agenda

Part IV of the Report explores the possibilities of linking the work of this Task Force to important ongoing global policy initiatives such as the Millennium Development Goals programme as well as the sustainable development goals which are part of the Post Rio+20 policy agenda. Section 9.3 investigates to what extent the potential indicator sets can also be relevant in a global context. The research into the availability of data at a global level shows that the construction of global datasets in the future is feasible. A "global" small set of indicators is also presented. The majority of indicators of this set are available for a surprisingly large number of countries. Furthermore, the indicators of the Millennium Development Goals complement well the "global" small set. In the post Rio+20 policy context, a strong cooperation between the statistical community and policy makers remains essential when constructing global sets of sustainable development indicators, as well as the formulating the sustainable development goals.

Annex to the short narrative

Table SN.Annex1. Sustainable development indicators: large set- conceptual categorisation (60 indicators)

Dimension	Sub-dimension	Theme	Aggregate indicator	Indicators showing distribution (inequality)
Human well-being ('Here and now')		HWB1. Subjective well-being	Life satisfaction	
		HWB2. Consumption and income	Final consumption expenditure	Income inequality, Gender Pay gap
		HWB3. Nutrition	Obesity prevalence	
		HWB4. Health	Life expectancy at birth	Distribution-health
		HWB5. Labour	Employment rate	Female employment rate, Youth employment rate
		HWB6. Education	Educational attainment	Distribution-education
		HWB7. Housing	Living without housing deprivation	
		HWB8. Leisure	Leisure time	
		HWB9. Physical safety	Death by assault/homicide rate	
		HWB10. Land and ecosystems	Bird index	
		HWB11. Water	Water quality index	
		HWB12. Air quality	Urban exposure to particulate matter	
		HWB13. Trust	Generalised trust	
			Bridging social capital	
		HWB14. Institutions	Voter turnout	Percentage of women in parliament
Capital ('Later')	Economic capital	EC1. Physical capital	Physical capital stock	
		EC2. Knowledge capital	Knowledge capital stock	
		EC3. Financial capital	Assets minus liabilities	
		EC-M. Economic capital	*Economic capital*	
	Natural capital	NC1. Energy resources	Energy resources	
		NC2. Non-energy resources	Non-energy resources	
		NC3. Land and ecosystems	Land assets	
			Bird index	
		NC4. Water	Water quality index	
		NC5. Air quality	Urban exposure to particulate matter	
		NC6. Climate	Global CO_2 concentration	
			State of the ozone layer	
		NC-M. Natural capital	*Natural capital*	
	Human capital	HC1. Labour	Employment rate	Female employment rate, Youth employment rate
		HC2. Education	Educational attainment	Distribution-education
		HC3. Health	Life expectancy at birth	Distribution-health
		HC-M Human capital	*Human capital*	
	Social capital	SC1. Trust	Generalised trust	
			Bridging social capital	
		SC2. Institutions	Voter turnout	Percentage of women in parliament
		SC-M. Social capital	*Social capital*	
Transboundary impacts ('Elsewhere')	Consumption and income	TI1. Consumption and income	Official Development Assistance (ODA)	
			Imports	
	Economic and financial capital	TI2. Physical capital	Export of physical capital	
		TI3. Knowledge capital	Export of knowledge capital	
		TI4. Financial capital	Foreign Direct Investment (FDI)	
	Natural capital	TI5. Energy resources	Import of energy resources	
		TI6. Non-energy resources	Import of non-energy resources	
		TI7. Land and ecosystems	Land footprint (foreign part)	
		TI8. Water	Water footprint (foreign part)	
		TI9. Climate	Carbon footprint (foreign part)	
	Human capital	TI10. Labour	Migration of human capital	

	Social capital	TI11. Institutions	Contribution to international institutions	

Table SN.Annex2.Sustainable development indicators: large set-thematic categorisation (90 indicators)

Theme	**Indicator type**	**Aggregate indicator**	**Indicator type**	**Indicator showing distribution (inequality)**
TH1. Subjective well-being	CORE-HW	Life satisfaction		
TH2. Consumption and income	CORE-HW	Final consumption expenditure	DIST	Income inequality
	OTHER	GDP per capita	DIST	Gender pay gap
	OTHER	Labour productivity		
	CORE-TI	Official Development Assistance (ODA)		
	CORE-TI	Imports		
TH3. Nutrition	CORE-HW	Obesity prevalence		
TH4. Health	CORE-HW/C	Life expectancy at birth	DIST	Distribution-health
	CORE-ADD	Healthy life expectancy at birth		
	CORE-ADD	Suicide death rate		
	INV	Health expenditures		
	DEPR	Smoking prevalence		
TH5. Labour	CORE-HW/C	Employment rate	DIST	Female employment rate
	CORE-ADD	Hours worked	DIST	Youth employment rate
	DEPR	Average exit age from labour market		
	CORE-TI	Migration of human capital		
TH6. Education	CORE-HW/C	Educational attainment	DIST	Distribution-education
	INV	Expenditures on education		
	CORE-ADD	Competencies		
	DEPR	Early school leavers		
	INV	Lifelong learning		
TH7. Housing	CORE-HW	Housing stock		
	INV	Investment in housing		
	CORE-ADD	Living without housing deprivation		
	OTHER	Affordability		
TH8. Leisure	CORE-HW	Leisure time		
TH9. Physical safety	CORE-HW	Death by assault/homicide rate		
	INV	Expenditures on safety		
TH10. Land and ecosystems	CORE-C	Land assets		
	INV	Protected areas		
	DEPR	Nutrient balance		
	DEPR	Emissions to soil		
	CORE-HW/C	Bird index		
	DEPR	Threatened species		
	CORE-TI	Land footprint (foreign part)		
TH11. Water	CORE-C	Water resources		
	DEPR	Water abstractions		
	CORE-C	Water quality index		
	DEPR	Emissions to water		
	CORE-TI	Water Footprint (foreign part)		
TH12. Air quality	CORE-HW/C	Urban exposure to particulate matter		
	DEPR	Emissions of particulate matter		
	CORE-ADD	Urban exposure to ozone		
	DEPR	Emissions of tropospheric ozone		
	DEPR	Emission of acidifying substances		
TH13. Climate	CORE-C	Global CO_2 concentration		
	DEPR	Historic CO_2 emissions		

	DEPR	GHG-Emissions		
	INT	GHG-Emissions Intensity		
	CORE-TI	Carbon footprint (foreign part)		
	CORE-C	State of the ozone layer		
	DEPR	CFC emissions		
TH14. Energy resources	CORE-C	Energy resources		
	DEPR	Consumption		
	INT	Energy intensity		
	OTHER	Renewable energy		
	CORE-TI	Import of energy resources		
	OTHER	Energy dependence		
TH15. Non-energy resources	CORE-C	Non-energy resources		
	DEPR	Domestic material consumption		
	PROD	Resource productivity		
	DEPR	Generation of waste		
	INV	Recycling rate		
	CORE-TI	Import of non-energy resources		
TH16. Trust	CORE-HW/C	Generalised trust		
	CORE-HW/C	Bridging social capital		
	INV	Contact with family and friends		
	INV	Participation in voluntary work		
TH17. Institutions	CORE-HW/C	Voter turnout	DIST	Percentage of women in parliament
	CORE-ADD	Trust in institutions		
	CORE-TI	Contribution to international institutions		
TH18. Physical capital	CORE-C	Capital stock		
	INV	Gross capital formation		
	CORE-TI	Export of physical capital		
TH19. Knowledge capital	CORE-C	Capital stock		
	INV	R&D expenditures		
	CORE-ADD	Knowledge spillovers		
	CORE-TI	Export of knowledge capital		
TH20. Financial capital	CORE-C	Assets minus liabilities		
	OTHER	Government debt		
	OTHER	Current deficit/surplus		
	CORE-ADD	Pension reserves		
	CORE-TI	Foreign direct investment (FDI)		

Table SN.Annex3. Relationship between the conceptual and thematic categorisation

Themes	Dimensions		
	Human well-being ('Here and now')	Capital ('Later')	Transboundary impacts ('Elsewhere')
TH1. Subjective well-being	HWB1		
TH2. Consumption and income	HWB2		TI1
TH3. Nutrition	HWB3		
TH4. Health	HWB4	HC3	
TH5. Labour	HWB5	HC1	TI10
TH6. Education	HWB6	HC2	
TH7. Housing	HWB7		
TH8. Leisure	HWB8		
TH9. Physical safety	HWB9		
TH10. Land and ecosystems	HWB10	NC3	TI7
TH11. Water	HWB11	NC4	TI8
TH12. Air quality	HWB12	NC5	
TH13. Climate		NC6	TI9
TH14. Energy resources		NC1	TI5
TH15. Non-energy resources		NC2	TI6
TH16. Trust	HWB13	SC1	
TH17. Institutions	HWB14	SC2	TI11
TH18. Physical capital		EC1	TI2
TH19. Knowledge capital		EC2	TI3
TH20. Financial capital		FC1	TI4
Economic and financial capital - monetary		*FC-M*	
Natural capital - monetary		*NC-M*	
Human capital - monetary		*HC-M*	
Social capital - monetary		*SC-M*	

TASK FORCE FOR MEASURING SUSTAINABLE DEVELOPMENT MANDATE AND ORGANISATION OF WORK

46. The Task Force for Measuring Sustainable Development (TFSD) is a follow-up to the UNECE/Eurostat/OECD Working Group on Statistics for Sustainable Development (WGSSD), which was established by the Conference of European Statisticians (CES) in 2005 to develop a broad conceptual framework for statistics on sustainable development based on the capital approach, and to identify a small set of indicators that could serve for international comparison. The outcome of the work was published in 2009[2].

47. In order to continue the work, the CES set up the UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development in 2009.

48. The Terms of Reference of the Task Force included the following aims:

- The Task Force will further refine and, if necessary, expand the small set of indicators based on the capital approach proposed by the WGSSD and will explore possibilities to include indicators that link the capital approach concept to policy-oriented indicators. The Task Force will examine the indicators in order to determine whether they capture the long-term conceptual perspective of the capital approach to measuring sustainable development.
- The work will follow up on dimensions unresolved in the Report, focusing on (but not limited to) social and human capital. The Task Force could include in the set of indicators new or revised long-term social and human capital indicators that the Task Force might identify.
- The Task Force will carry out further work on comparing the proposed indicators with the existing national and international indicator sets and will assess their compatibility with policy-oriented indicators, as well as their usefulness for both international and inter-temporal comparisons.
- The Task Force will further explore the limits of the monetization methodologies and, where possible, advance them.
- The Task Force will consider conducting a consultation with policy makers in order to validate the policy relevance of the indicators based on the capital approach among CES member countries.
- The Task Force will analyse the set of indicators from the point of view of data availability and resource implications for their compilation by official statisticians and others.

49. The original mandate of the TFSD focused on the inter-generational aspects of sustainable development (i.e. ensuring the well-being of future generations, the so-called future-oriented approach). In agreement with the CES Bureau, the mandate was extended to also cover the intra-generational aspects of sustainable development (i.e. the well-being of both current and future generations, the so-called integrated approach). Instead of trying to establish which approach is the "correct" one, the group decided to focus on describing the overlap and commonalities between the two approaches.

50. The Task Force consisted of high-level experts selected from the statistical and academic communities with strong experience in the area. Representatives from several international organizations (OECD, Eurostat, World Bank, the United Nations Commission for Sustainable Development and UNECE) participated in the work.

[2]*Measuring Sustainable Development*, available at http://www.unece.org/stats/archive/03.03f.e.htm

51. The Task Force met three times during its mandate: 16-17 September 2009; 18-19 November 2010; and 19-20 May 2011, in Geneva. A wiki was used for virtual discussions. The Task Force members prepared thirteen issue papers on which the Report is based. During the course of its work, the Task Force provided regular progress reports to the Conference of European Statisticians and its Bureau. Consultations with the CES Bureau in January/February 2011 and with all CES members in March 2011 showed general support for the work. A second global consultation was held in February 2013.

52. The Task Force builds on the work of the WGSSD as well as other international initiatives such as GDP and Beyond (European Commission), Progress and well-being/Better Life initiative (OECD), Eurostat's work on sustainable development indicators and the Sponsorship Group for Progress, Well-being and Sustainable Development (Eurostat/INSEE). The publication in 2009 of the Stiglitz-Sen-Fitoussi Report also played an important role. The members of the Task Force followed closely, provided input and took on-board the main outcomes of these initiatives. Furthermore, the Task Force benefited from the fact that a number of its members participate in other initiatives.

53. The present Report provides an overview of the measurement issues and, where possible, advances them. A thorough screening of existing datasets on sustainable development is presented, focusing on the commonalities in the various approaches. Based on the measurement theory and data availability, a set of sustainable development indicators is proposed. The set includes indicators covering the human well-being of the present generation (intra-generational aspects of sustainable development), indicators for the amount of economic, human, natural and social capital stocks currently available, and which could potentially be passed to future generations (i.e. the inter-generational aspects) and indicators on the transboundary impacts (i.e. the impact of that improving well-being in one country has on the rest of the world). In other words, the proposed measurement system reflects the basic trade-offs regarding human well-being between 'here and now', 'later' and 'elsewhere'.

54. Compared to the outcome of the WGSSD, the Task Force further developed the work in the following directions:

(a) The measurement of human and social capital is more elaborate as it builds on the most recent methodological insights derived from academic literature;

(b) The TFSD took into account aspects of human well-being of the present generation as well as international and distributive issues and the inter-generational aspects of sustainable development. The work of the TFSD will enable the statistical community to better quantify the fundamental trade-offs (the 'here and now' versus 'later' and 'elsewhere'), as mentioned in the Brundtland Report;

(c) The TFSD paid special attention to the concept of 'official statistics'. The availability of proposed indicators in international statistical databases is analysed;

(d) The TFSD expanded the work of the WGSSD on the commonalities between various SDI sets used by countries and international organizations. In order to increase the practical utility of this report, a heavy emphasis is placed on the data availability;

(e) The TFSD Report distinguishes between core indicators and "policy levers" and provides a more flexible way of presenting an SDI set. It can either be presented using a conceptual categorisation, which is split into the "now, later, elsewhere" dimensions, or along thematic lines which makes it more relevant for policy purposes (the thematic categorisation). The Report also proposes indicators which are of direct relevance to policy makers, highlighting some of the key "drivers" influencing the core indicators. The finer grained and more policy-relevant indicators can reflect the levels of investments or productivity/efficiency changes and are particularly relevant because they can indicate whether countries are likely to be on a sustainable development path.

LIST OF ABBREVIATIONS

BOD	Biochemical oxygen demand
CDIAC	Carbon dioxide information analysis center
CBS	Statistics Netherlands
CES	Conference of European Statisticians
CPI	Consumer price index
DESTATIS	Federal Statistical Office of Germany
ESS	European Statistical Survey
EU	European Union
EU27	The 27 member countries of the European Union
EU KLEMS	European Union level analysis of capital (K), labour (L), energy (E), materials (M) and service (S) inputs
GDP	Gross Domestic Product
HDI	Human development index
HPI	Happy planet index
IEWB	Index of economic well-being
INSEE	National Institute of Statistics and Economic Studies of France (Institut national de statistiques et études économiques)
ISEW	Index of sustainable economic welfare
ISIC	International standard industrial classification
LDC	Least developed countries
LPI	Living planet index
MEW	Measure of economic well-being
MFP	Multi-factor productivity
NACE	Classification of economic activities in the European Community
NSO	National statistical office
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
PIAAC	OECD programme for the international assessment of adult competencies
PIRLS	Progress in international reading literacy study
PISA	OECD programme for international student assessment
R&D	Research and development
SDI	Sustainable development indicators
SEEA	System of environmental-economic accounts
SNI	Sustainable national income
SNA	System of National Accounts
SSI	Sustainable Society Index
TFSD	UNECE/Eurostat/OECD Task Force for Measuring Sustainable Development
TIMSS	Trends in international mathematics and science study
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNECE	United Nations Economic Commission for Europe
WCED	World Commission on Environment and Development
WGSSD	UNECE/Eurostat/OECD Working Group on Statistics for Sustainable Development
WSSD	World Summit on Sustainable Development

FULL REPORT

55. The Report consists of three parts.

56. Part I links the concepts of human well-being and capital to create a conceptual framework to measure sustainable development. The framework is based on academic literature and international measurement initiatives and is consistent with the Stiglitz-Sen-Fitoussi report. It distinguishes between human well-being 'here and now', 'later' and 'elsewhere'. Special attention is paid to distributional issues.

57. Part II explores the methodological aspects of measuring sustainable development and identifies themes for the concepts of human well-being, capital, and transboundary impacts.

58. Part III presents a list of potential sustainable development indicators under the sustainable development themes. Three indicator sets are proposed: two large sets of 90 and 60 indicators and one small set of 24 indicators. The Annexes provide useful information at a more detailed level. Especially Annex VIII which presents the data availability of the potential indicators suggested by this Task Force for 46 countries may be very useful for the reader that wishes to understand the relationship of this report to individual countries.

59. Part IV explores areas of further work and makes an inventory of remaining measurement issues that need to be resolved. It delves deeper into issues of communication and visualisation which should help statisticians to reach broader audiences with their work. Finally, this part of the Report describes how the work of this Task Force might fit in the policy initiatives which are undertaken in the wake of the Rio+20 conference.

60. Readers interested in the way in which sustainable development is conceptualised, may focus on Part I. The second part of the Report is the most technical and focuses on identifying the sustainable development themes and related measurement issues. For those interested in developing a SDI set, Part III contains the most useful information in terms of the presentation of a list of possible sustainable development indicators.

PART I. CONCEPTUAL BACKGROUND

61. Part I of the Report develops a conceptual framework for sustainable development. It consists of three chapters.

62. Chapter 1 identifies the basic concepts and definitions which are used in the remainder of the report.

63. Chapter 2 provides a historical overview of measurement efforts in this field. Five main areas are identified where there are differences of opinion on how to measure sustainable development.

64. Finally, Chapter 3 presents a detailed model linking the concepts of human well-being and capital in an intertemporal and interspatial framework. It provides a detailed analysis of the relationships between the dimensions of 'here and now', 'later' and 'elsewhere'.

CHAPTER 1. INTRODUCTION

1.1. Background

65. There is widespread understanding that society needs a better statistical 'compass' to shift emphasis from measuring economic phenomena to measuring sustainable development. The latter concept entails making choices between using the resources to maximise current human well-being or preserving the resources for future use; or between maximising the human well-being of one country at the expense of others. Contrary to most prevalent macroeconomic indicators such as GDP, sustainable development pays due attention to current human well-being in the broadest sense of the word (and its distribution across and within countries), as well as to the inter-generational aspects of human-well-being, focusing among others on the depletion of natural resources, climate change and so on.

66. The present Report was prepared by the Joint UNECE/OECD/Eurostat Task Force for Measuring Sustainable Development (TFSD). It develops a broad conceptual framework for measuring sustainable development and proposes three sustainable development indicators sets. Progress has been made in several of the areas covered by the mandate of the Task Force, including the measurement of the well-being of the present and future generations. The ways in which a country in the pursuit of well-being for its own citizens may affect the well-being of the citizens of in other countries are discussed in depth. Finally, the Report analyses the results of an extensive screening of existing datasets with sustainable development indicators, focusing on the commonalities in the various approaches.

67. The Task Force decided not to adopt a one-size-fits-all approach in proposing the suggested set of indicators. While the themes can be considered universal (such as education, health, etc.), the actual indicators may differ from country to country. The proposed measurement framework is flexible and allows the indicators to be presented in two different ways. The conceptual categorisation follows the Brundtland definition and distinguishes human well-being 'here and now', 'later' and 'elsewhere'. Alternatively, the indicators can be arranged thematically according to policy areas.

1.2. Basic Concepts and Definitions

68. The Brundtland definition of sustainable development is taken as a starting point. The definition states that sustainable development is development which "meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations World Commission on Environment and Development 1987: 423).

69. The Brundtland definition can be interpreted in different ways depending on what is considered to be the object of sustainability, and what is meant by the terms "sustainable", "development" and "needs". This section aims to introduce some of the basic concepts used in this report, such as sustainable development, human well-being and capital as well as the ways in which they are linked.

70. The definition introduces both a time dimension (present and future) and a space dimension. The latter is linked with "meeting the needs of the present [generation]". Those needs are not met when the benefits and burdens (rights, responsibilities, risks, capabilities, access to goods, services and opportunities are unfairly allocated among members of a given generation. The space distribution of human well-being, which should be seen in a broad sense and not be restricted to income, deals with the differences in well-being between countries. However, this Report also stresses the importance to assess distributional issues *within* countries. The distribution of well-

being between countries is referred to in the Report as the "transboundary impact", and the distribution within a country as "distributional issues" or "inequality". Essentially, sustainable development is a matter of distributional justice across time and space.

71. Chapter 2 of this Report presents different perspectives on sustainable development. Some approaches regard only the inter-generational aspects relevant and focus on the human well-being of future generations, whereas others also wish to include the human well-being of the present generation. The measurement system proposed by this Task Force addresses both issues. Those who prefer to follow an integrated view on sustainable development can use all proposed indicators. People who rather want to stress the future aspects may use a sub-selection of indicators that are relevant to assessing whether enough resources are left to future generations.

Capital and human well-being

72. The well-being of present and future generations crucially depends on how society uses its resources. These resources are not limited to material items such as machinery, equipment, energy and other mineral resources, but also include knowledge, the quality of the natural environment as well as the quality of social and institutional structures. These resources are at the core of the 'capital approach', which comprises economic, human, natural and social capital (for an interesting article on sustainable development from a SD perspective, see: Arrow et al. 2010). Capital is measured in terms of stocks, which are built up through investments. For economic capital and parts of natural capital, the guidelines as to how to measure these stocks are laid down in statistical handbooks such as the System of National Accounts (SNA) and the System of Economic and Environmental Accounts (SEEA). Figure 1.1 shows how human well-being is related to the resources (the different types of capital) that underpin it.

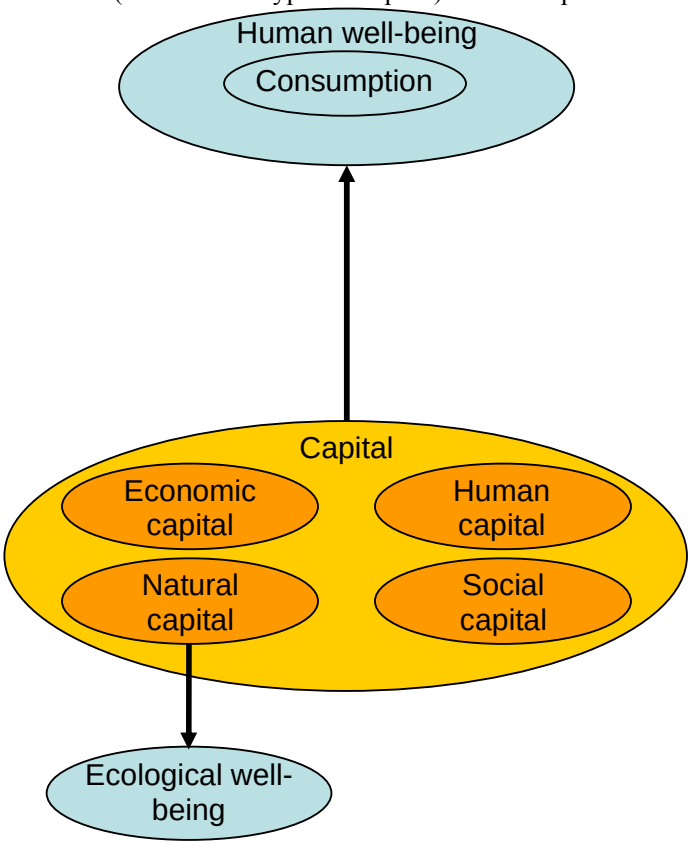

Figure 1.1. Capital and human well-being

The following definitions are used in the report:

Human well-being: A broad concept which is not confined to the utility derived from the consumption of goods and services, but which is also related to people's functioning and capabilities (i.e. the freedom and possibilities they have to satisfy their needs).
Consumption: Represents the utility that consumers derive from the use of goods and services. It is usually measured in terms of final household consumer expenditures.
Capital: A stock or resource from which revenue or yield can be extracted. Originally capital was strictly seen as physical, man-made capital (such as machinery & equipment, buildings and infrastructure. Gradually, the capital concept has been broadened by also including natural, human and social capital.
Ecological well-being: A concept which focuses on the intrinsic value of nature and its ecosystems, not necessarily reflected in the value these systems have for human beings.
Sustainable development: A development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

73. Consumption can be seen as a subset within this overall concept of human well-being. It represents the utility that consumers derive from the use of goods and services and exclusively focuses on the command that people have over commodities. However, having certain commodities at one's disposal is not enough to generate well-being. People should be free and able to use these commodities in such a way that they truly satisfy their needs. This perspective relates to the 'functioning and capabilities' which are stressed by Amartya Sen (Sen 1993, 2000). Sen's approach emphasises the importance of freedom: the more freedom people have, the larger the range of their opportunities and the greater their quality of life. Human well-being can also be determined by factors other than command over commodities. For example, psychological, biophysical and socially related phenomena are of paramount importance for people's sense of well-being.

74. Society has a number of available resources that are necessary to maintain human well-being over time. These resources can be described in terms of economic, natural, human, and social capital (CES 2009). Figure 1.1 presents a simplified representation of the relation between the concepts of capital, human well-being and sustainable development. A more elaborate analysis of the ways in which capital enhances human well-being is provided in Chapter 3.

75. The discussion on sustainable development often emphasises the special nature of natural capital. Without natural capital humanity could simply not survive. This approach to natural capital is anthropocentric, as natural capital is only considered of value if it provides ecological services to the benefit of humans. However, certain types of natural capital, such as biodiversity, have an existence value irrespective of their use by society. This aspect is represented by the term "ecological well-being" in Figure 1.1.

Temporal dimension of sustainable development: 'now' versus 'later'

76. Figure 1.1 is a static representation of human well-being. It does not show whether well-being can be maintained in the future. From an intergenerational perspective, sustainable development is development that ensures future generations a level of human well-being at least equal to that prevailing today. And a necessary condition for this to happen is that the per capita stock of wealth is non-declining, which requires replacing or conserving the elements of that wealth (that is, stock of economic and financial, natural, human and social capital).

77. Figure 1.2 refers only to the *potential* for sustainable development. On the one hand, there is no guarantee that future generations will manage the capital stocks in a sustainable manner. On the other hand, the state of technology and social organization could allow for efficiency gains in the use of resources.

78. Figure 1.2 takes the time-dimension into account - 'now' versus 'later'. It shows that, through the production process, different capital stocks lead to the production of both the goods and services that are consumed by people, and other attributes of people (e.g. their health, education) which generate human well-being. The capital stocks that are transferred to future generations will enable them to satisfy their demands and sustain their levels of human well-being. Chapter 3 will describe in more detail the factors determining human well-being and discuss how it can be sustained over time.

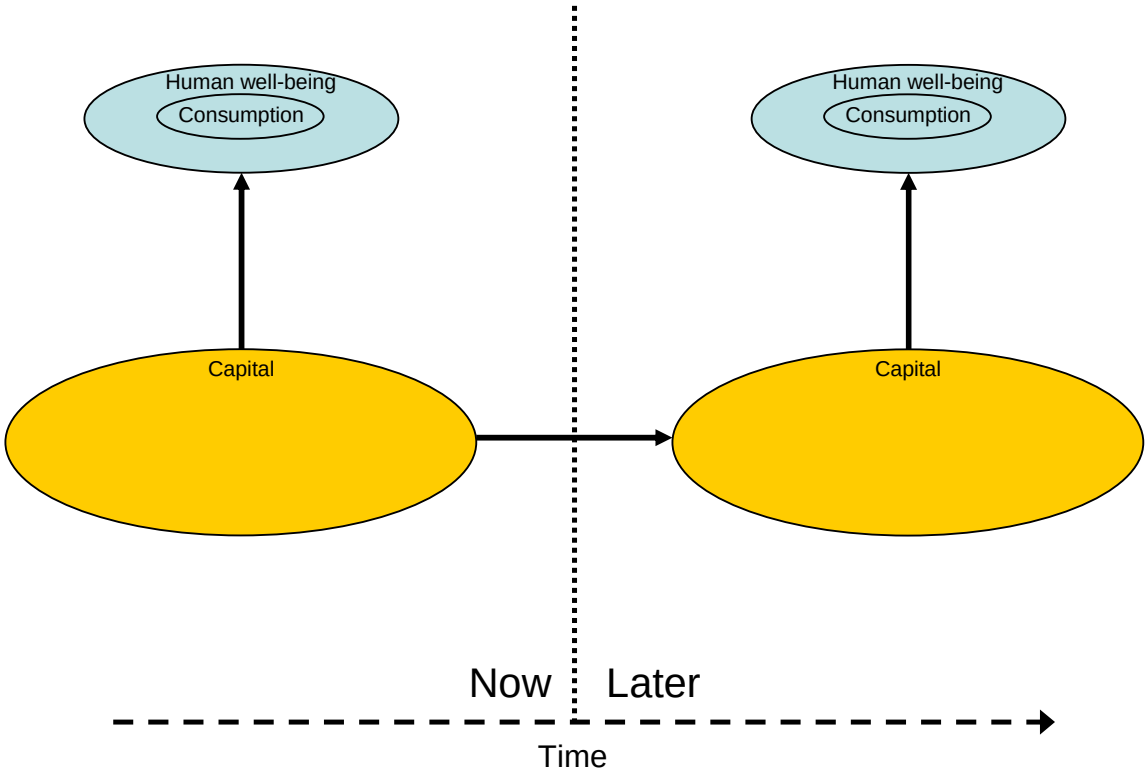

Figure 1.2. Sustainable development: 'now' versus 'later'

Spatial dimension of sustainable development: 'here' versus 'elsewhere'

79. The capital approach is relevant to the Brundtland definition. It also provides the tools to analyse the transboundary impacts of sustainable development, i.e. to assess to what extent countries influence each other in the process of ensuring the well-being of their populations.

80. In building up human well-being, a nation can use its own resources, but can also import them from abroad. Due attention should therefore be paid to the international transfers of different types of capital, and in particular on how economic activities in one country impact the natural capital available in others or globally. The human well-being in a country can be affected by imports and exports of economic capital (machinery and equipment), as well as by imports and exports of human capital (for example through the transfer of knowledge associated with migration).

81. Figure 1.3 introduces the space dimension. The figure emphasises the importance of international flows of labour, goods and capital in enhancing or reducing the well-being of people living in other countries — 'i.e. the dimensions 'here' and 'elsewhere'.

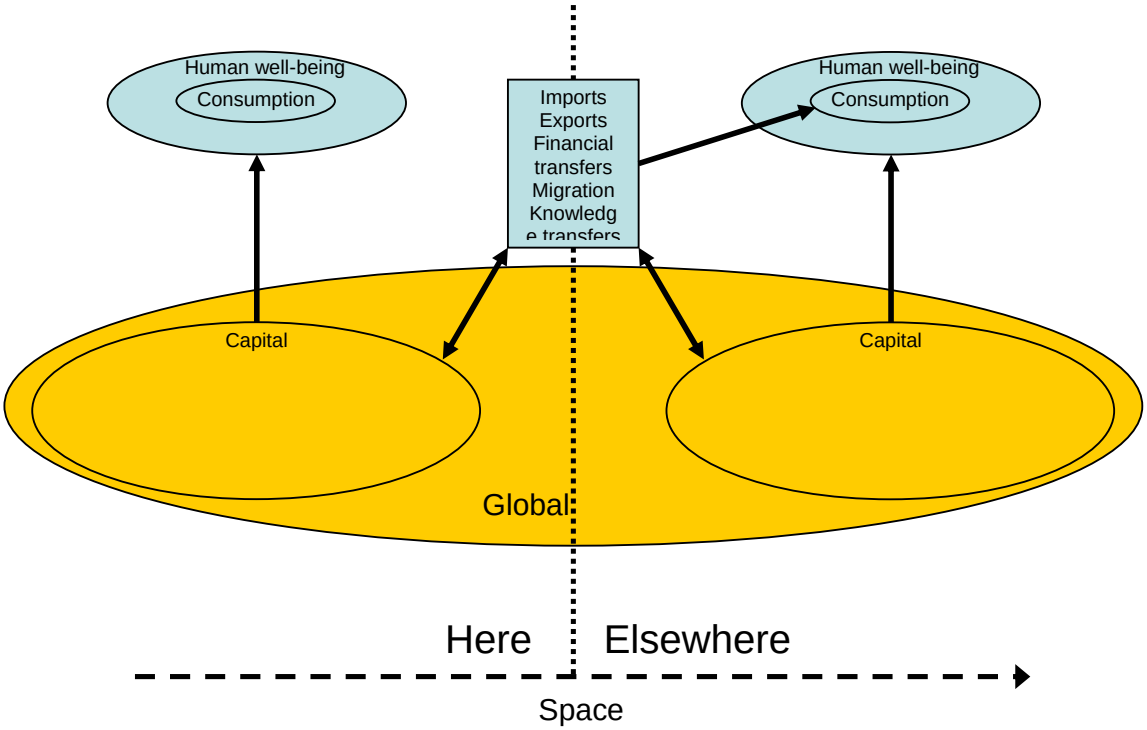

Figure 1.3. Sustainable development: 'here' versus 'elsewhere'

CHAPTER 2. PERSPECTIVES ON SUSTAINABLE DEVELOPMENT

82. This chapter presents a brief overview of existing approaches used to measuring sustainable development, as well as some of the main debates in this area. Section 2.1 gives a short account of the history of measuring human well-being and sustainable development, while Section 2.2 describes current developments. Finally, Section 2.3 focuses on a number of key discussions in the field of measuring sustainable development that account for the different approaches used in this field.

2.1. A brief historical overview

83. The concepts of human well-being and its sustainability have a long history. These notions have been developed in a variety of disciplines such as philosophy, economics and natural sciences. This section provides an historical overview of the literature in this field. Such an overview is important to have a better understanding of the current measurement efforts and debates.

2.1.1. Measurement of the economy

84. Measurement of the economy goes back many centuries3, but its modern variety finds its origin in the period of the great depression in the 1920s and 1930s. In the following decades, the initial ideas were debated and elaborated by a number of prominent economists. Kuznets, Leontief and Stone received Nobel prizes for their work related to the National Accounts. The work of many other Nobel laureates such as Hicks, Meade and Frisch contributed to improving the system (see Studenski, 1958; Bos, 2003).

85. "A System of National Accounts and Supporting Tables, Studies in Methods" was first published in 1953. The report subsequently evolved into the System of National Accounts (SNA) and was updated several times to reflect the statistical developments (1960, 1964. 1968, 1993)[4]. The latest 2008 revision reinforces the status of the SNA as one of the most important statistical standards to date (SNA, 2008).

86. The SNA was criticised since its inception for what the system measures and what it does not (for an overview of arguments, see van den Bergh, 2008). Some very fundamental debates and disagreements preceded even the publication of the first version of the SNA. For example, there was a large debate on whether or not the government should be considered as a producing sector, and its output included in GDP.[5,6]

[3] The World Bank (2011) sees the Doomsday book, commissioned by William the Conqueror in 1058/59, as one of the first efforts to measure "wealth". At the end of the 17th century, national income estimates were produced in England (Petty, 1665; King 1696) and France (Boisguillebert and Vuban, 1707). later, Quesnais produced the *Tableau Économique* (Quesnay, 1759). For a history of this early period, see Studenski, 1958; Bos, 2003.

[4] All versions of the SNA are available at http://unstats.un.org/unsd/nationalaccount/hsna.asp

[5] An alternative system, the material product accounts, was used up to 1993 in the former Soviet Union and many east european countries. This system covered only the production of goods and transport, but excluded (government) services.

[6] Kuznets, who was against the inclusion of government output, lost this debate against the Keynesian school of thinking (Lintott, 1996). The current GDP estimates would be very different if these debates had led to different conclusions.

87. The SNA has proved to be one of the most successful statistical innovations in history. It has yielded influential indicators such as Gross Domestic Product (GDP). Estimates of GDP are produced by nearly every country in the world and for very long time periods (Maddison, 2001).

2.1.2. Pre-Brundtland period: Economic composite indicators

88. An influential environmental movement emerged in the 1950s and 1960s in response to increasing concerns about the detrimental effects of economic production on the environment. Books such as Rachel Carson's "Silent Spring" (1962), Garret Hardin's "Tragedy of the Commons" (1968) and Paul Ehrlich's "Population Bomb" (1968) set the tone for a growing academic and popular interest in the "limits to growth"[7]. In parallel to this development, the criticism of macroeconomic measures such as GDP, which do not incorporate environmental or other external effects, also increased.

89. This led to many initiatives to "correct" GDP and other macroeconomic aggregates to provide a better indicator for (social) welfare or sustainable welfare. A variety of *economic composite indicators* emerged in the 1960s and 1970s. Many of these early initiatives focussed on specific aspects such as the monetisation of household work and the "correction" of GDP for defence expenditures.

90. Accounting for environmental aspects came somewhat later and was stimulated by two events in 1972. In that year, the report of the Club of Rome "Limits to growth" was published: the report presented a Malthusian confrontation of limited resources on one side and a growing population on the other (Meadows et al, 1972). Also in 1972, the United Nations Conference on the Human Environment was held in Stockholm. The Conference participants agreed that economic development and environmental quality must be managed in a mutually beneficial way. Both events helped to raise environmental concerns from the national level to the global arena.

91. In the 1970s, a number of initiatives aimed to "correct" national accounts aggregates for environmental and other non-market factors. These initiatives included the Measure of Economic Well-being (MEW) developed by Nordhaus and Tobin (1973) and the Sustainable National Income (SNI) measure proposed by Hueting (1974).

92. The initial composite indicators were very much academic products. Some of them did get attention in statistical and policy circles, but none managed to become the "official" alternative to GDP.

2.1.3. Post-Brundtland period: Composite indicators and SDI sets

93. The concept of sustainable development made an international breakthrough when the Report of the United Nations' World Commission on Environment and Development (WCED) *Our Common Future* was published in 1987 (WCED, 1987)[8]. The report is often referred to as the Brundtland Report, after Gro Harlem Brundtland, the chairperson of the WCED. The report was

[7] The notion of the "limits to growth" which is very important in sustainable development is often attributed to Thomas Malthus, a British demographer and political economist. In his *Principle of Population* (1798), Malthus concluded that a population could never grow indefinitely because the area of agricultural land is fixed and will therefore only be able to produce a fixed amount of food. As Malthus put it: "the power of population is indefinitely greater than the power in the earth to produce subsistence for man." Malthus, however, underestimated technological change. Due to increases in agricultural productivity, food output has grown to such an extent that the limits of food production have not been reached yet.

[8] Note that the term "sustainable development" was coined for the first time in an international document *World Conservation Strategy*, published by the International Union for the Conservation of Natural Resources in 1980. The document did not, however, contain a specific definition of sustainable development.

important in broadening the scope of sustainable development beyond environmental concerns to include social aspects at the national and international levels.

94. While the Brundtland report is usually credited with the conceptualisation of sustainable development, the United Nations conferences in Rio (1992) and Johannesburg (2002) provided a major impetus to the measurement of sustainable development. The United Nations established the Commission on Sustainable Development (CSD) in the early 1990s, which presented its first set of sustainable development indicators in 1993[9].

95. From the mid-1990s onwards, many national statistical offices gradually became involved in the measurement of sustainable development. Examples include the United Kingdom, Norway, Canada, Australia, Switzerland, Germany, the Netherlands, New Zealand and Brazil amongst many others.

96. Also, starting from the end of the 1990's, several major international organisations such as the European Union, Eurostat, the OECD, UNECE and the World Bank launched large-scale projects to measure sustainable development or societal progress. Annex I provides a short description of the most important initiatives.

97. The measurement of sustainable development since the publication of the Brundtland report and the 1992 Earth Summit in Rio has progressed in three main directions: composite indicators, indicator sets and satellite accounts.

Composite indicators

98. The composite indicators developed in the 1990s by a number of economists built on the work started in the 1960s and 1970s. Examples include the Index of Sustainable Economic Welfare (Cobb, 1989), the Genuine Progress indicator (Cobb et al, 1995), the Index of Economic Well-being (Osberg and Sharp, 2002); the Genuine Savings (Pearce and Atkinson, 1993); and the Sustainable Net Benefit Indicator (Lawn and Sanders, 1999).

99. Although most of this work on economic indicators is of an academic and research nature, its insights are starting to impact on statistical work. For example, the System of Environmental and Economic Accounting 2012 (SEEA2012), which is a satellite account of the SNA, includes a number of macro-economic aggregates which are corrected for the depletion of resources (e.g. "depletion adjusted net value added"). While these 'corrections' are limited to only some of the domains of sustainable development, they imply that complements to the SNA baseline-indicators are being developed within the realm of official statistics.

100. Another type of composite indicator also emerged during this period, the roots of which are not based on the accounting framework of the system of national accounts. While the methodologies for these composites vary, they are typically calculated as an average of a number of aggregate indicators. The best known example is the Human Development Index (HDI), which is published annually by the UNDP and is computed as a weighted average of indicators covering economy, education and health (UNDP, various years). Another influential indicator that appeared during this period is the Ecological Footprint (EF), which represents the amount of land and sea area necessary to supply the resources a human population consumes and to assimilate the associated waste (Rees

[9] http://www.un.org/esa/dsd/csd/csd_index.shtml

and Wackernagel, 1994).[10] Other examples of *composites* include the Happy Planet Index (HPI), the Sustainable Society Index (SSI) and the Living Planet Index (LPI).[11]

101.Annex II provides an overview of a number of prominent composite indicators.

102.A third type of indicator that gained prominence in the 1990s and 2000s is based on the direct measurement of people's subjective well-being. These indicators are calculated based on individuals' assessment of their life satisfaction or by measuring people's feelings about recent episodes of their life (Kahneman and Kruger, 2006). Although these subjective measures have been discussed by economists since the 1970s (Easterlin, 1974), the field has greatly gained considerable momentum in the last decade (Anielski, 2007 and Layard, 2011).

Indicator sets

103.Since the mid-1990s, a growing number of national statistical offices and international organisations have started to use sets of indicators to measure sustainable development. In this approach, the multidimensional character of sustainable development is not reduced to a single metric, but is represented by a broad range of indicators that provide information on the various dimensions of sustainable development.

2.2. Harmonisation of the Measurement of Sustainable Development

104.The post-Brundtland era has been a highly fruitful period in the theoretical and practical measurement of sustainable development. However, there seems to be little convergence toward a common approach. Nearly every country, institute and academic researcher that has looked into the issue has produced a "new and improved" approach.

105.The lack of harmonisation is partly due to the fact that countries consider different aspects to be most important for their sustainable development, which leads to different policy priorities. Cultural, religious and philosophical viewpoints also play a role. Other reasons for the lack of harmonisation in this measurement field relate to differences in academic approaches and data availability.

106.Despite the above arguments, it is important to note that some harmonisation initiatives in the field of measuring sustainable development are already occurring.

107.The harmonisation process started in the early 1990s. In 1993, the United Nations Commission for Sustainable Development recommended a list of SDIs after extensive consultation with stakeholders. The set was subsequently revised in 2001 and 2006. The CSD set is not prescriptive and is not based on a single statistical database. It is rather meant to provide a common starting point for developing national SDI sets. The CSD set is well respected, but many statistical institutes have chosen very different domains and indicators when creating their own indicator set.

108.An important contribution to the harmonisation process was provided by the Stiglitz-Sen-Fitoussi report, commissioned by the president of France, Nicolas Sarkozy (Stiglitz et al, 2009). The report's implications reached well beyond France, and led to both Eurostat and the OECD initiating specific activities to implement its recommendations. The EU "Sponsorship group for measuring progress, well-being and sustainable development" (co-chaired by Eurostat and France-

[10] See http://www.footprintnetwork.org for extra information. For a critical appraisal, see van (Van den Bergh and Verbruggen (1999).

[11] For the Happy Planet Index (HPI) see happyplanetindex.org; Sustainable Society Index (SSI): Van der Kerk, 2008; http://www.ssfindex.com/ssi/; the Living Planet Index (LPI): WWF, 2010.

INSEE), was mandated to advance the implementation of the Stiglitz-Sen-Fitoussi report recommendations in the EU countries.

109.The work of the Task Force for Measuring Sustainable Development (TFSD) and its predecessor, the Working Group for Statistics on Sustainable Development (WGSSD), can also be seen as part of this harmonisation effort. Both groups are joint initiatives of three important international organisations (UNECE, OECD and Eurostat) and include members from the European Union, the World Bank and a number of national statistical offices and government bodies. The work by these two groups to compare existing indicator sets and to develop a common measurement framework provides an important basis for further harmonisation.

110.Whether greater harmonisation in the measurement of sustainable development will occur will partly depend on the willingness of institutes to converge. Many organizations have good reasons to keep the indicator sets which they have developed: these sets have often been developed at considerable cost, have gone through extensive stakeholder consultations and are therefore well respected and well known. On the other hand, it is quite inefficient for all institutes to develop different conceptual frameworks and indicator sets. As the measurement of GDP is harmonised internationally, indicators to measure "beyond-GDP" will be less effective if they are country specific. Past experiences (e.g. the processes of the SNA and SEEA) show that a harmonisation process takes several decades. Whether it will be possible to arrive at a common approach depends on whether a common agreement can be found on the different viewpoints set out in the following section.

2.3. Five Key Issues in the Measurement of Sustainable Development

111.In this section five areas of potential disagreement in the measurement of sustainable development are discussed. Different answers to these key questions lead to different ways to measure sustainable development. The five key issues are:

- Starting point for building an SDI set
- Environmental or a broad societal perspective
- Integrated or a future-oriented view
- Monetisation
- Composite indicators or SDI sets

2.3.1. Starting point for developing indicators to measure SD

112.There are at least two different ways to build an SDI set. Firstly, the measurement system can be based on conceptual thinking, academic literature and theoretical notions about 'sustainability', 'development', the object that has to be sustained, etc. Secondly, an SDI set can be set up to assess issues which are deemed to be of critical importance by policymakers and/or other stakeholders[12].

113.The above description refers to two polar cases. In practice, it is difficult to classify approaches strictly into the first or second category. Some SDI sets lean more towards the conceptual approach while others are more aligned with the policy targets.

114.Also, there is a variety of conceptual approaches that could be used. One of these is the capital approach, which is prominent in the academic literature and was adopted in both the Stiglitz-Sen-

[12] In the WGSSD report, these two approaches were called the 'conceptual and the 'policy' approach. these terms are not adopted in this report because they may lead to confusion. Many indicator sets have a conceptual basis *and* are policy relevant. This is also the case for the indicator set proposed in chapter 8 of this report.

Fitoussi and in the WGSSD reports. The capital approach is explained in more detail in Chapter 5 of this report.

115.Another example of a conceptual approach is the MONET framework, which was developed in Switzerland and later modified and adopted by the statistical office of New Zealand. While it has a conceptual basis, the MONET framework was developed through an extensive stakeholder consultation to select the themes and indicators. In this approach, the conceptual measurement can be closely linked to policy targets.

116.The advantage of a conceptual basis is that it is backed by solid theoretical thinking derived from academic literature. The disadvantage is that the relevance of some of these indicators is not always obvious to the policy makers or general public.

117.The advantage of aligning the measurement with policy targets is that the indicators can be used for monitoring purposes. This ensures their wider use and visibility. The disadvantage is that the indicators may be biased towards particular policy priorities at the expense of other aspects of sustainable development. Furthermore, it is difficult to ensure continuity as changes in policy priorities may make it necessary to replace indicators.

118.*The TFSD aimed to link the two approaches to allow flexibility in their implementation and make use of the advantages of both views. This report therefore proposes, a flexible conceptual framework, which takes on board the insights provided by the indicator sets that are based on extensive consultations with policy makers and other stakeholders.*

2.3.2. Environmental or broad societal perspective

119.A large part of the literature on sustainable development focuses on environmental aspects. The Brundtland Report was instrumental in broadening the concept to include economic and social aspects. From this perspective, nearly all of the current SDI sets reflect the broader definition of sustainable development proposed by the Brundtland report. From this perspective, the environmental dimension is an important component of sustainable development, but is only part of the broader concept.

The TFSD has opted for the broad societal approach. The concept of human well-being and capital incorporates environmental, economic and social issues. This approach allows for the analysis of the fundamental trade-offs underlying all discussions about sustainable development.

2.3.3. Integrated or future-oriented view

120.Two different views have been expressed on how to interpret the concept of sustainable development (CES, 2009). The "integrated view" states that the goal of sustainable development is to ensure the human well-being of both those currently living and of future generations. The "future-oriented view" strictly focuses on the well-being of future generations. Both views have their advantages and disadvantages.

121.The integrated approach aims to reconcile the needs of present and future generations explicitly. This approach considers both the intra-generational and inter-generational aspects as important. The intra-generational aspects relate to meeting the needs of the present generation, i.e. the distribution of benefits and burdens between different groups within one country as well as their distribution between countries at the global level. The inter-generational aspects concern meeting the needs of the future generation by leaving them enough assets to generate sufficient well-being. The integrated approach builds on the work of the Brundtland Commission, calling attention to the fundamental trade-offs between human well-being 'here and now', 'elsewhere' and 'later'.

122.The advantage of the integrated approach is that it brings together the two aspects of distributional justice, namely the inter-generational and the intra-generational ones. The disadvantage is that the integrated approach aims to cover all aspects related to human well-being. It can thus lose focus and easily become a "theory of everything".

123.The future-oriented approach focuses only on inter-generational issues. It is closely linked with the "capital approach", because the latter underscores the maintenance of the stocks of capital as a prerequisite to maintaining human well-being in the long run.

124.The future-oriented "capital approach" has a solid academic foundation. Another advantage of the future-oriented approach is that, by narrowing the scope of sustainable development to its inter-generational dimension, the concept can offer policy direction. Many policies are aimed at the current well-being and many official statistics already exist to monitor these short-term developments: bringing together statistics which are concerned with the long-term development of society can therefore lead to new insights.

125.The disadvantage is that the approach ignores the (basic) needs of the present generation, an element which is important in the Brundtland Report. Besides, it is difficult to concentrate policy attention on indicators that focus on future needs while there are many urgent problems that require attention here and now.

126.*The TFSD allows the user to choose which approach to adopt. The Report describes both approaches in detail and explores their overlap. The Report includes a flexible framework which can be used to measure sustainable development from both perspectives.*

2.3.4. Monetisation

127.A third debate focuses on the question of whether capital indicators should be presented in a monetised form. Monetary estimates of economic capital, parts of natural capital and research and development (R&D) are currently calculated by quite a few national statistical offices. However, some domains of natural capital, as well as human and social capital, are rarely or never monetised within the realm of official statistics. It should be noted that the use of monetary estimates of these forms of capital is disputed because of the strong assumptions on which they are based.

128.The only estimates providing aggregate monetary measures of total wealth (summing up the total value of economic, natural, human and social capital) are the national wealth estimates provided by the World Bank (2003, 2006 and 2011). A summary estimate of the total stock of capital (national wealth) allows a direct assessment of whether development is on a sustainable path or not.

129.One of the problems of monetisation is that it uses, where available, market prices as a measure of the value of the capital stock. This approach assumes that market prices are determined in a perfectly functioning market, and reflects the marginal contribution of different goods and services to people's utilities.[13]

[13] The WGSSD report notes that the functioning markets rarely achieve the ideal conditions economists impose upon them in their valuation methods (CES 2009, pages 54-55, box 3). the Stiglitz-Sen-Fitoussi report also acknowledges that the right valuation of the stocks of capital is often problematic, in particular "when market prices for assets are not available or subject to bubbles and bursts" (Stiglitz-Sen-Fitoussi report, recommendation 3, §24). it states that "the monetary approach requires imputations and modelling which raise informal difficulties" (Stiglitz et al, 2009, recommendation 11, §38).

130.The use of market prices also implies perfect substitutability between the various stocks of capital. Their relative scarcity is assumed to be fully reflected in their prices. This perspective is known as 'weak sustainability'. Many observers, however, advocate an opposite perspective of 'strong sustainability', which assumes that the possibilities for substitution between different capital stocks are limited. The fact that some parts of natural capital stocks are deemed to be irreplaceable is a powerful argument against calculating (monetary) aggregate measures for total capital or wealth (CES 2009, page 56-57). Measures which implicitly assume that declining stocks of critical natural capital are offset by increases in non-critical capital (e.g. machinery or physical infrastructure such as roads) may be misleading from the perspective of sustainable development.

131.A further issue of monetary measures of capital, discussed by the Stiglitz-Sen-Fitoussi report, relates to the ethical questions associated with discounting over generations: "Discounting is unavoidable from a practical point of view (to avoid infinite sums), but is ethically problematic: in principle all people should be treated equally, irrespective of their date of birth …anyway, whatever we do, practical indexes of welfare requiring intertemporal aggregation until the end of times are both hard to build, and clearly hard to communicate upon" (Stiglitz et al 2009, p. 251-252; see also Samuelson 1961 and Fleurbaey 2008). Section 5.6 discusses the problems associated with monetisation in more detail.

132.*The TFSD is cautious with regard to monetisation of non-market assets, as these techniques are often based on arbitrary assumptions. Part of the capital stocks which are monetised within the System of National Accounts (economic capital) will also appear in a monetised form in an SDI set. The SEEA 2012 offers guidance on how to provide monetary estimates of some forms of natural capital such as natural resources. For human capital, experimental work done by the OECD and others is presented later in this report. No methods for monetisation for social capital have been developed so far*.

2.3.5. Composite indicators or SDI sets

133.In the history of measuring sustainable development, one of the core differences among alternative approaches relates to the choice between composite indicators and indicator sets. At present, nearly all international organizations and national statistical offices use indicator sets. The World Bank is a partial exception, as it relies on composite monetary indicators (genuine savings/comprehensive wealth) in its research on sustainable development (World Bank 2011). Composite indicators are more popular in academia and among environmentalist groups who find it easier to communicate their message using a single indicator (see Annex II for a short description of a number of composite indicators). Policymakers can be found on both sides of the debate, with some in favour of indicator sets to guide their policies and others in favour of a composite indicator.

134.*The TFSD puts forward a set of indicators because there are, from the standpoint of official statistics, no reliable weights with which to aggregate the various indicators into one composite indicator*.

CHAPTER 3. LINKING CAPITAL TO HUMAN WELL-BEING

3.1. 'Now' versus 'Later'

135.This chapter describes how the concepts of capital and human well-being can be linked in a framework to measure sustainable development.

136.Human well-being of the present and future generations depends on how society uses its resources. The more efficiently these resources (economic, natural, human, and social capital) are used in the 'here and now', the more capital is left for people elsewhere on the planet and for future generations.

137.The Stiglitz-Sen-Fitoussi report concludes that it is crucial to pay attention to both the present as well as to future aspects of well-being. However, it stresses that the two aspects should be reported in different parts of the measurement system. Stiglitz et al maintain that "the assessment of sustainability is complementary to the question of current well-being or economic performance, but must be examined separately". They argue that many studies of sustainable development do not make this distinction and, as a result, convey unclear and confusing signals. "For instance, confusion may arise when one tries to combine current well-being and sustainability into a single indicator. To take an analogy, when driving a car, a meter that added up in one single number the current speed of the vehicle and the remaining level of gasoline would not be of any help to the driver. Both pieces of information are critical and need to be displayed in distinct, clearly visible areas of the dashboard" (Stiglitz *et al.,* 2009, p. 17).

138.The starting point of the framework for measuring sustainable development is therefore to distinguish between the 'now' and 'later' dimensions. While this was already done in Figure 1.2, the links are elaborated in Figure 3.1. The central notion in Figure 3.1. is "human well-being". This concept has many connotations, and is covered under different terms in various academic fields such as economics, social sciences, psychology, etc. In general, it refers to the quality of people's life.

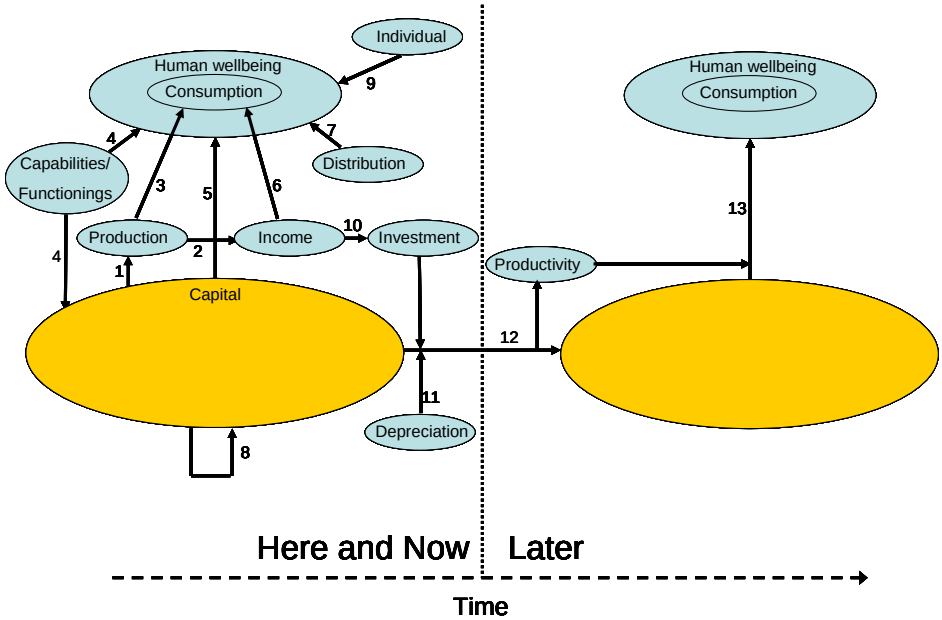

Figure 3.1. Sustainable development: 'now' versus 'later'

139.Figure 3.1 identifies the main determinants of human well-being and sustainable development and explicitly takes into account the time perspective:

[1] Goods and services are produced in production processes which use resources (or capital). In economics, this process is often described in terms of a 'production function' relating inputs and outputs.

[2] In the production process, the factors of production (capital stocks) are rewarded, thereby generating income.

[3] Finally, the goods and services produced are consumed by individuals, providing "utility" to them. The sum of utilities from consumption across all persons is sometimes referred to as "welfare" in economics. In economics, it is common to model the preferences of individuals using a utility function.

140.The first three steps are common to the standard model in economics. The model needs to be expanded in a number of ways when it is applied to other aspects of human well-being, not directly linked with production and consumption:

[4] Functioning/capabilities: Having command over certain commodities may not necessarily lead to higher levels of well-being. It is important that people have the freedom and therefore real opportunities to satisfy their needs and pursue their goals in life. Amartya Sen in his work strongly emphasises these aspects (Sen, 1985).

[5] Capital also has a direct effect on human well-being (as opposed to the indirect effect through the production of goods and services). For example, individuals with a high level of human capital (either a high education level or good health) show higher levels of subjective well-being, even when controlling for income and other factors (Lomas, 1998; Healy, 2001).

[6] Human well-being is positively correlated to income at the level of each person. However, there is also evidence that income relative to peer and family members can also be important for people's self-reported well-being (see [7]).

[7] Research on the impact of life events on subjective well-being also suggests that people can show some degree of resilience or adaptation to events over time. Reaching a certain goal in life, such as getting married, can provide a temporary spike in well-being, but this effect may wear off over time (Stiglitz and Becker, 1977; Becker, 1996 and Bowles, 1998; Clark, Diener, Georgellis and Lucas, 2008). However, there are large individual differences in both the rate and the extent to which adaptation occurs, and for some life events adaptation is either absent or incomplete (see Diener, Lucas and Napa Scollon, 2006, for a review). For example, the effects of disability and unemployment persist over time in many cases (Oswald and Powdthavee, 2008; Lucas 2007; Lucas, Clark, Georgellis and Diener, 2004). Some authors have emphasised access to both material and social resources as factors that can determine the extent of adaptation to adversity (e.g., Cummins, 2000).

[8] The different capital stocks are interrelated but distinct from each other. Growth of one capital stock can lead to more productive use of other types of capital, as in the case of social capital, which promotes the use of other resources. There are also complementarities between physical and human capital, as new machines will also require new skills in the population (see Goldin and Katz, 1999). At the same time, while some types of capital are depleted through use (e.g. economic capital) others are further enhanced by it (e.g. skills are developed through on-the-job training, and can depreciate when people are unemployed).

[9] Finally, well-being is not only affected by resources but also by individual psychological characteristics and availability of information (Zajonc, 1980; Argyle 1987; Kahneman et al., 1994; Bradburn, 1996; Lewin, 1996; Deneve and Cooper, 1998).

141.The discussion of Figure 3.1 illustrates that there are many mechanisms through which human well-being can be influenced. The conceptual model uses terminology that is common to economic measurement, but because economic determinants only tell part of the story, the model is enriched by research from political and social sciences.

[10] Part of the income from production processes is used for consumption [3] while the other portion can be invested in capital stocks. Since the latter can be used in future production processes, it is often referred to as "delayed consumption".
[11] The new level of a capital stock is determined by investments but also by depreciation and other changes (for example, discoveries of new oil fields).
[12] The resulting level of capital stock can be used by future generations for their own well-being. For economic and natural capital, it is easy to see that capital stocks can be transmitted to future generations. For knowledge capital (such as R&D), as well as human and social capital, this link is provided by the mechanisms of path dependency. Path dependency explains how the set of decisions one faces for any given circumstance is limited by the decisions made in the past. The choices made by societies typically have long-run effects. For example, due to the huge investments in building up institutional frameworks (relating to different areas such as the knowledge system - national system of innovation, education system, legal systems, - or civil society structures, etc.), high transaction costs may make it hard for societies to break away from the existing structures and move to new ones. Therefore, investments in human and social capital are not only relevant for the current generation, but they also impact on the well-being of the next generation.
[13] The effect of productivity should be mentioned. Due to efficiency gains, less capital may be needed in the future to generate the same amount of well-being that is produced today. At the same time, efficiency gains are not always exogenous. The more the 'asset boundary' of the system is expanded, i.e. the more types of capital are distinguished, the more these efficiency gains can be accounted for by the increases in capital instead of by some exogenous technical change, which is not explained by the model.

3.2. 'Here' versus 'elsewhere'

142.In an ever globalising world sustainable development can not be described at just a national level. Inevitably, due to free-market forces countries impact on one another. The problem of global poverty is one of the most important issues in the transboundary impacts that countries have in terms of sustainable development. In fact, the Brundtland Report pays due attention to the (increasing) income gap between rich and poor countries and sees this growing inequality as a threat to global sustainable development.

143.Following the conceptual framework which is proposed in this Report, it is useful to make a distinction between current and future well-being of the population in developing countries. One of the ways to stimulate current human well-being in developing countries is through economic development. Developed countries may affect this through "trade and aid", although in some cases institutional support may be even more effective. Development assistance, the existence of trade barriers and the total trade with developing countries are therefore good indicators regarding the effects of trade on the current welfare of developing countries.

144.There are, however, two caveats. Firstly, these measures do not say anything about where the benefits of "trade and aid" will end up. In some, often institutionally weak, countries a sizeable portion of the gains associated with "trade and aid" may accrue to a small minority of the population or go to large multinationals. The distribution of the income generated by these flows may therefore be of very little benefit to the population at large. Secondly, the trade of goods and services can be unsustainable, from an inter-generational point of view, because the developing countries are depleting their capital stocks beyond regenerative or critical limits.

145.Secondly, the transboundary impact of one country on the rest of the world can be charted by focusing on the ways in which a country uses (non renewable) sources from abroad and therefore may harm the long-run well-being of the countries in question.

146.Figure 3.2 shows the relationships between capital and human well-being in a global context. The relationship between 'here' and 'elsewhere' is referred to in the Report as the 'transboundary impacts' of sustainable development. It is visualised in a similar way as in Figure 3.1.

147.In addition to national capital stocks, Figure 3.2 includes the concept of global capital, of which the climate system is probably the best example. No country "owns" the atmospheric system but each country contributes to climate change through its own greenhouse gas emissions.

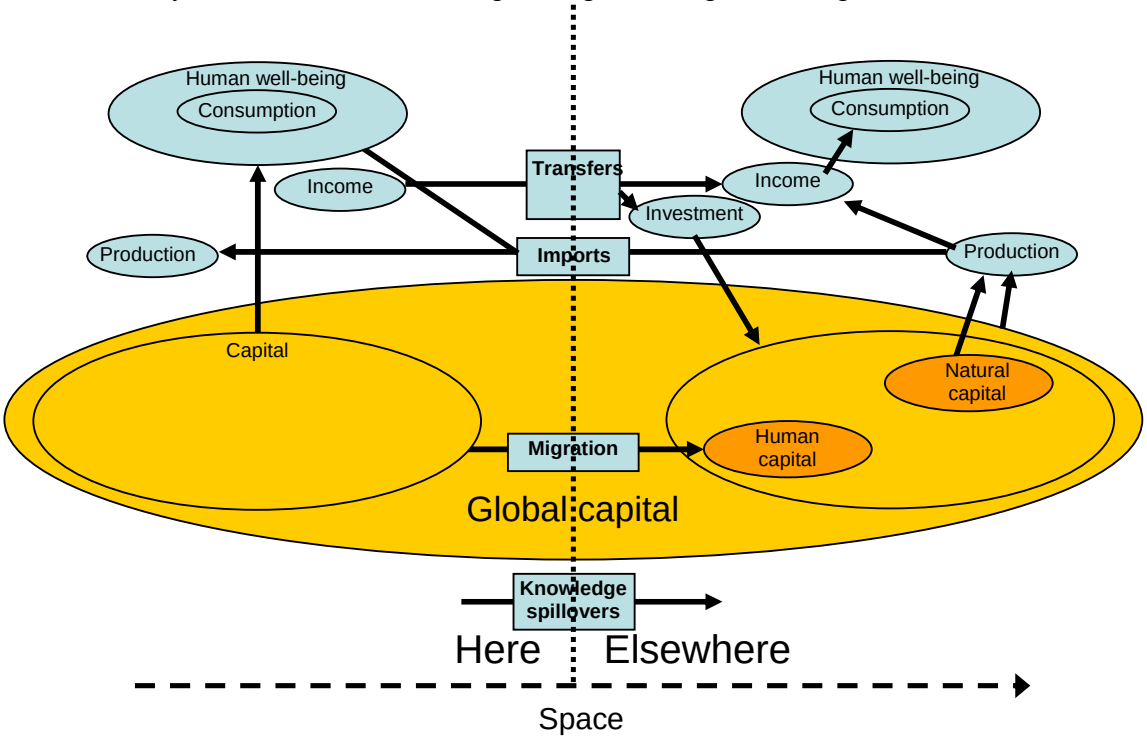

Figure 3.2. Sustainable development: 'here' versus 'elsewhere'

148.Figure 3.2 identifies a number of ways in which a country may impact well-being in other countries:

- *Financial flows/income transfers.* Money may be transferred from one nation to another. The reasons may be humanitarian or developmental (as in the case of Official Development Aid, (ODA), or may relate to the repatriation of income of foreign nationals to their home country (e.g. migrant remittances or repatriation of profits earned abroad). A country might also grant loans to foreign countries or invest in them through foreign direct investment. All these financial transfers have varying impacts on the current and future well-being of the receiving country and the donating country.
- *Imports/exports of goods and services.* Probably the most important link between countries is provided by international trade in goods and services. Importing commodities provides the importing country with goods and services for consumption or use in the production process. Conversely, exporting commodities provides the exporting country with higher income and consumption possibilities. The importance of international trade for economic prosperity has been subject to academic research for many centuries (Ricardo, Hecksher-Ohlin, Krugman). In the context of sustainable development, the use of natural capital for the production of goods and services that are imported/exported has a particular importance. Through these imports, economic activities 'here' will impact on natural resources 'elsewhere'.
- *Migration.* When people migrate or relocate temporarily to other countries, their human capital (education, health) is also transferred. On one side, migration reduces the stock of human capital of

the country of origin while, on the other, it generates remittances and work experiences that will benefit the country of origin when workers return home. Some developing countries are confronted by the so-called "brain-drain", whereby a young, well-educated workforce seeks employment in other countries and often never returns.

- *Knowledge transfers.* Technological progress is vitally important for economic growth. Knowledge "spillovers" from one country to another may occur through a variety of channels, such as the technology embodied in imported capital goods, the knowledge embodied in persons, or the cooperation in international R&D and patenting. International takeovers, mergers and foreign direct investments can be useful catalysts of the above effects.

149. Although these are all important mechanisms, the literature on the transboundary impacts of sustainable development has mainly focused on two aspects: the depletion of natural capital and the impact of high income countries on the rest of the world.

PART II. EXPLORING THE DIMENSIONS AND THEMES OF SUSTAINABLE DEVELOPMENT

150. Part II of this Report describes the measurement of human well-being and sustainable development on the basis of academic literature and statistical handbooks. The aim of Part II is to identify the themes which should be part of a sustainable development framework. Chapters 4-6 focus on the three different dimensions of sustainable development: human well-being ('here and now'), capital ('later') and the transboundary impacts ('elsewhere').

CHAPTER 4. MEASURING HUMAN WELL-BEING

4.1. Concepts and definitions

151. The concept of human well-being has many different connotations. This reflects the use of different labels in a wide range of academic fields (economics, philosophy, psychology, etc.) for describing the same or similar constructs. The report by Stiglitz, Sen and Fitoussi (SSF) (2009) acknowledges the different perspectives and provides a good summary of the various viewpoints. Instead of choosing one of these approaches, the Stiglitz-Sen-Fitoussi report proposes to address the concept of human well-being using a comprehensive framework that combines the strengths of the various approaches that exist. The TFSD subscribes to this inclusive philosophy and discusses three dominant schools of thought: welfarism and two non-welfarist approaches, i.e. subjective well-being and Sen's functionings and capabilities approach. In this chapter, the insights from these various schools are described in order to identify the main themes of human well-being that should be included in a SDI set.

Welfarism

152. Fleurbaey (2009) provides an overview of different perspectives on 'welfare' the term most commonly used in the economic literature to refer to the well-being of individuals and of society at large.

153. Traditionally, economists have followed a welfarist approach in which well-being is related to the utility that people derive from consumption. In practice, the concept of utility is derived by observing the actual choices that people make, which in turn are based on people's preferences and opportunity sets. Therefore, the more conventional way to describe human well-being is to analyse people's consumption choices (food, clothing, shelter).

Subjective well-being approach

154. The literature on subjective well-being formulates some powerful criticism of the traditional welfarist approach (Frey and Stutzer, 2000; Frey and Stutzer, 2002a and b; Diener and Oshi, 2000; Easterlin, 2001; Charness and Grosskopf 2001; Deci and Ryan, 2001; Hagerty and Veenhoven, 2003; Bruni and Porta, 2005; Veenhoven, 1993, 1996 and 2000b; WDH 2003). This literature argues that the ways in which people value their lives (for example, in terms of life satisfaction, positive or negative emotions or "affect" and eudaimonia[14]) should be an integral part of the concept of human well-being. The quantification of human well-being should therefore not be restricted to what people choose to consume and how these consumption choices affect their health, educational level etc., but should extend to direct measures of people's feelings and evaluations of life. The measurement of subjective well-being has traditionally been undertaken in academia and by social research institutes. However, the several national statistical offices have been developing indicators of subjective well-being through their own surveys, and the Stiglitz-Sen-Fitoussi Report has further stimulated interest in these measures. Work is also ongoing at the OECD to develop guidance for both compilers and users of subjective well-being data, so as to encourage greater production of these data and increase their comparability.

155. The subjective well-being literature provides a positive shift away from the purely materialist approach of traditional welfarism (focused on the commodities consumed by each person). The

[14] A diverse construct which focuses on good psychological functioning and the realisation of one's potential (or self-actualisation). Definition and measures often include a sense of worthwileness, as well as feelings of competence, autonomy, resilience, interest in learning, goal orientation etc.

notion of subjective well-being is in itself complex. In particular, it is important to distinguish conceptually between how people think about their lives (for example, cognitive evaluations of overall satisfaction with life, which can be affected by memory, even if it may not be easy to disentangle these two aspects in practice.

Sen's functionings and capabilities approach

156. Another problem of the welfarist approach is that it fails to distinguish between "obtaining what one wants" and "being satisfied with what one has". Scholars such as Sen reject the one-sided emphasis on the latter category. Sen (1985) warns that focusing on the resources that individuals have at their disposal neglects the fact that individuals have unequal abilities to transform resources into well-being. Sen conceptualises people's well-being by means of the 'functioning and capabilities approach' (Sen, 1993). This approach refers to the activities and situations that people spontaneously recognize to be important to them. Functionings can be interpreted as a series of achievements of each person, e.g. in education, health and other areas. Sen also underscores the importance of looking beyond these achievements to include the full range of opportunities open to people (i.e. their 'capabilities'). Therefore, Sen emphasises the importance of freedom: the more freedom people have, the larger the range of their opportunities and the greater their well-being. The key issues at stake in this approach concern people's agency, meaning that individuals should be seen as actors in their own development.

4.2. Selection of themes

157. The previous section discussed the theoretical foundations of the measurement of human well-being. However, translating these insights into the choice of actual themes is not easy. An early attempt to compile such a list of themes was made by Maslow (1943) in his work on human needs.[15]

158. Following the recommendations of the Stiglitz-Sen-Fitoussi report, the measurement of both objective and subjective well-being should be part of a dataset on sustainable development. Therefore, the list presented in Table 4.2 includes two general or cross-cutting themes as a measure of human well-being: "subjective well-being" and "consumption and income" (to reflect the welfarist approach based on consumption).

159. The two general themes listed above provide only an imperfect summary measure for human well-being. They should therefore be complemented by indicators for more specific themes. This is done by exploring a number of studies in this field. The following studies were analysed:

i. The UNDP Human Development Report presents the Human Development Index (HDI), which can be seen as an attempt to Sen's functionings and capabilities approach. It includes education, health and income as the primary dimensions.
ii. The Stiglitz-Sen-Fitoussi report identifies the following main dimensions of human well-being: material living standards, economic insecurity, health, education, personal activities including work, personal insecurity, social connections and relationships, environmental conditions and political voice and governance.
iii. The subjective well-being research of Richard Layard (2005) describes the main determinants of well-being, which he refers to as the 'Big Seven': family relations, financial situation, work, community and friends, health, personal freedom (in terms of a democratic

[15] Maslow distinguishes the following human needs: food, water, clean air, safe neighbourhood, medical insurance, job security, financial reserves, friendship and belonging to a group. Besides, Maslow pointed at the importance of esteem needs (the way people perceive themselves) and self-actualisation (the extent to which people are able to fully use their potential and realise their goals in life).

society), and personal values (people's outlook on life). While the list is not exhaustive, the empirical research shows that people's life satisfaction depends primarily on these drivers.

iv. Eurostat's feasibility study for well-being indicators distinguishes a number of human well-being themes and indicators (Eurostat sine anno).

v. The OECD report *How's life?* defined human well-being in terms of eleven dimensions, grouped under the themes of 'material conditions' (income and wealth, jobs and earnings, housing) and 'quality of life' (health status, education and skills, work and life balance, social connections, civic engagement and governance, environmental quality, personal security and subjective well-being). The dimensions selected by the OECD are explicitly based on those used in the Stiglitz-Sen-Fitoussi report.

160. The result of this short of this short survey is summarised in Table 4.1. Since the studies reviewed use different names to describe similar themes, there is no common basis for comparison. The theme classification used in Table 4.1 is therefore a combination of the classifications used in the five studies investigated.[16]

Table 4.1: Common themes used in studies on human well-being

Themes	Human Development Report	Stiglitz-Sen-Fitoussi report	Layard's big 7	Eurostat's well-being study	OECD (How's life?)
Subjective well-being		X	X	X	X
Consumption and income	X	X	X	X	X
Nutrition					
Health	X	X	X	X	X
Labour					X
Education	X	X		X	X
Housing					X
Leisure		X			X
Physical safety		X		X	X
Land and ecosystems		X		X	
Water		X		X	X
Air quality		X		X	X
Trust		X	X	X	X
Institutions		X	X	X	X

161. Table 4.2 section shows 14 themes that are considered relevant to the measurement of specific aspects of human well-being.

[16] In some of the studies, the themes mentioned in the left-hand column of table 1 are somewhat differently labelled. in the Stiglitz-Sen-Fitoussi report, subjective well-being is labelled as "measures of subjective well-being which provide key information on people's quality of life". In Layard's study, this theme is described as personal values (people's outlook on life). The theme 'consumption and income' is included in the Stiglitz-Sen-Fitoussi report labelled as "material living standards", whereas Layard uses the term "financial situation". The theme trust is consistent with "social connections and relationships" (SSF) and "family relations; community & friends" (Layard). The theme "institutions" is included in the Stiglitz-Sen-Fitoussi report in terms of "political voice and governance", and by Layard as "personal freedom" (in terms of a democratic society).

Table 4.2 Selected themes of human well-being

Dimension	Sub-dimension	Themes
Human well-being		HWB1. Subjective well-being
		HWB2. Consumption and income
		HWB3. Nutrition
		HWB4. Health
		HWB5. Labour
		HWB6. Education
		HWB7. Housing
		HWB8. Leisure
		HWB9. Physical safety
		HWB10. Land and ecosystems
		HWB11. Water
		HWB12. Air quality
		HWB13. Trust
		HWB14. Institutions

CHAPTER 5. MEASURING CAPITAL

5.1. Introduction

162. This chapter focuses on the measurement of capital, i.e. the assets used to generate well-being and which, from a future-oriented perspective, should be preserved (or even further enhanced) for future generations.

163. Section 5.2 starts with a short history of the concept of capital, describing the forms of capital which are now incorporated in the SNA and the "more recent" types of capital (natural capital, human and social capital) that feature prominently in today's discussion on sustainable development.

164. Sections 5.3-5.6 present a short methodological overview of economic, natural, human, and social capital respectively and identify the specific capital themes to be included in a SDI set.

165. Section 5.7 discusses the advantages and limits of monetisation.

5.2. Concepts and definitions

166. The focus on capital has its roots in the so-called production function literature where changes in economic production are explained by changes in labour and capital inputs. The neoclassical aggregate production function, the so-called Solow growth model, describes GDP as a function of labour (hours worked), capital inputs and technology (i.e. the efficiency with which labour and capital are used) (Solow 1956).

167. Labour is defined by the numbers of hours that people work. The term capital is used to describe a stock or resource from which revenue or yield can be extracted. In the early work of Robert Solow capital was defined in terms of economic capital and dealt with man-made assets which are of a physical nature, such as machinery and equipment and buildings.

168. GDP = *f*(Lab, Cap, Tech), where:
GDP: Gross Domestic Product;
Lab: Labour;
Cap: Economic Capital;
Tech: Level of technology

169. In this formulation, increases in economic capital lead to growth in GDP and labour productivity. This means that higher levels of economic output can be generated by the same amount of labour inputs. In this formulation, technological progress is assumed to be fully exogenous.

170. The production function is a useful way of thinking about economic growth in the long run. However, it only considers the economic output, measured by GDP, and does not cover other aspects of human well-being that are integral to sustainable development. As explained in Chapter 4, this Report takes a broader perspective of human well-being. Another drawback of the traditional production function is that it only includes economic capital and labour inputs. This Report uses a broader capital concept to account for the broad range of benefits which are relevant for human well-being and sustainable development.

171. From the 1960s onwards, several economists started to re-think the concept of capital, coming to the conclusion that the focus on economic capital (essentially machinery, equipment and

infrastructure) was too narrow. Other types of assets also contribute to economic growth and should be included in the capital concept.

172. The first addition to the production function has been that of human capital, which focuses on the quality of labour (often measured in terms of workers' educational attainment). There is today a quite large literature discussing monetary valuation methods of the stock of human capital and the economic effects of human capital accumulation (Becker 1964 and 1975; Jorgenson and Fraumeni 1995; Barro 2001 and Aulin 2004).

173. Since the 1960s and 1970s, the focus on the environment has also led to increased attention to the measurement of natural capital. Certain natural resources (fossil fuels and other natural resources) are included in the SNA. The System of Environmental and Economic Accounts (SEEA), which was adopted by the Statistical Commission of the United Nations in 2012, has bolstered the measurement of these sub-soil resources.

174. Social capital is the most recent addition to non-traditional forms of capital (Bourdieu 1986; Putnam 1993, 1995 and 2000; Fukuyama 1995 and 2000; Grootaert 1997; Dasgupta 2000 and 2002; Durlauf and Fafchamps 2004). The social capital literature shows that the trust which is built up within human networks is an important determinant of economic growth as well as of human well-being (World Bank 2006).

175. Although the measurement of economic capital has the longest history, its definition has also evolved over time, with the SNA asset boundary recently extended to include Research and Development (R&D). Until 2008, expenditure on R&D was considered as an intermediate input, while it is now considered as an instrument which amounts can be cumulated into a stock measure.

5.3. Economic capital

5.3.1. Concepts and definitions

176. Measures of economic capital – which, in the definition used here, include physical, financial and knowledge capital – are the most advanced of all capital measures, reflecting decades of research by economists and statistical agencies. Given that the measurement of economic capital is the most developed, this Report does not go into detail of its measurement methodology. Instead, a broad overview is given and references are provided where more details can be found.

177. Definitions and methodologies for measuring economic capital are laid down in standards and handbooks such as the SNA (United Nations 1993, 1998, 2008) and the OECD manual "Measuring Capital" (OECD, 2001). Annex III of this Report presents the relationships between the categories of assets listed in the SNA and the categories of assets used in this report.

178. The concepts underlying the measurement of economic capital provide a useful framework for thinking about measurement of a broader set of capital stocks. As the OECD manual explains, stocks of economic capital yield services that increase economic output, income and labour productivity (OECD, 2001). The creation of a stock of capital, in turn, requires flows of investment. To build stocks of capital over time and obtain these services, societies must set aside resources for investment. Economic capital also tends to depreciate as time passes, and some investment is needed to make up for this depreciation. For economic capital, prices are needed to compare and relate real (inflation-adjusted) stocks and flows over time.

179. Furthermore, when comparing future benefits to current consumption, a discount rate is needed; this discount rate values a dollar of future benefits less than a dollar of current

consumption. In this context, "sustainability" may be defined as the presence of levels of investment that are sufficient to keep the capital stock intact over time.

5.3.2. The impact on human well-being

180. People derive well-being from consuming products which are produced on the basis of the narrowly defined production function described in section 5.2. In that sense, economic capital has a positive effect on well-being. But economic capital is also used for types of production which do not increase human well-being. For example, one can think of the negative effects of economic production on the environment (externalities).

5.3.3. Physical indicators and valuation

181. Although the SNA defines the types of assets that should be measured as capital, it does not directly show how to measure these capital stocks. The OECD's report "Measuring Capital" describes in more detail the measurement of physical capital stocks as well as related concepts such as capital services (OECD, 2001).

182. As mentioned above, in the 2008 edition of the SNA, the concept of economic capital has been broadened to include Research and Development (R&D) expenditures, which were considered as intermediate consumption in the SNA 1993. In the SNA 2008, R&D expenditures are recorded as investment that builds a stock of intangible capital. The methodologies for measuring R&D investment and capital stocks are still under discussion. R&D capital stock has a special role in the context of sustainability as an enabler of technological development that allows for increases in productivity. To reflect this important role, the R&D is identified as a separate theme within the economic capital under the label "knowledge capital". Recently, the OECD produced a handbook looking at the measurement of Intellectual Property Products to assist countries in adopting the latest international standards (2008 SNA).

183. Lately, several authors have also stressed the importance of other types of intangible capital which are not incorporated in the SNA (Corrado et al, 2006). Although this is an interesting field of research, it has not yet matured to the point that it can be included in the asset list used in this report.

184. The recent financial crisis has also highlighted the importance of financial capital in economic sustainability, which is further elaborated in Box 5.1. For a closed economy, and on a global scale, financial capital is a zero-sum stock. For every liability there is an equal and opposite asset. However, within the national boundaries, financial assets can exceed liabilities or vice versa.

Box 5.1: The role of financial capital in economic sustainability

Even though financial capital is a zero-sum game at a global level, these assets and their distribution are important in the discussion of sustainable development. This has become all the more obvious in the most recent financial crises.

First of all, although financial assets are claims on real assets (as shares are claims on a firm's real and intangible assets), they need to be part of a *comprehensive* assessment of economic sustainability. Such a comprehensive approach is all the more necessary as, with securisation, mutually dependent financial instruments are built up whose sum total greatly exceeds the value of the real assets underpinning them. The fall of one instrument may lead to the crumbling of the entire pyramid and even to a crisis of the whole system.

Secondly, from a sustainability perspective, it is important not to look just at the *net* position (the money value of assets less liabilities) at a point in time for a country as a whole. The net positions may look good or even improve over time due to increases in asset prices which are unsustainable. Making an assessment

of economic sustainability, therefore, requires a judgment on the sustainability of the underlying prices.

For the economic sustainability of a country, both its overall financial position with respect to the rest of the world (current account deficits implying a higher stock of foreign liabilities), as well as the *distribution* of financial positions, matter. The distributional aspects are important for two reasons:

- The position of each institutional sector (government, households, financial intermediaries and non-financial firms) should be separately considered. Even if, in a closed economy, the assets of one sector are the liability of another (and therefore the balance is zero by definition), this can still lead to unsustainable situations in cases where households are running up debts and firms are reducing theirs. While economists most often focus on the sustainability of government debt, the financial position of other institutional sectors is also important.

- Even *within* a sector (for example households) the distribution of assets and liabilities matters for sustainability. Mortgages may be increasing for some households and falling for others; also, when real estate prices start to fall, the high-indebted households may find that the value of their house is lower than the value of their outstanding debt. If they are forced to sell their houses, this may trigger a further decline of real estate prices, leading to a sustainability crisis.

5.3.4. Selection of themes

185. Table 5.1 summarises the themes of economic capital that are distinguished in this Report. The relationship between the themes in the table and those of the SNA is described in Annex III.

Table 5.1 Classification economic and financial capital

Dimension	Sub-dimension	Themes
Capital	Economic capital	EC1. Physical capital
		EC2. Knowledge capital
		FC1. Financial capital

5.4. Natural Capital

5.4.1 Concepts and definitions

186. Natural capital refers to all naturally occurring assets that have a direct or indirect impact on human well-being. The System of Environmental-Economic Accounts (SEEA), which is the main statistical framework to measure natural capital, includes the following definition: “Environmental assets are the naturally occurring living and non-living components of the Earth, together comprising the bio-physical environment that may provide benefits to humanity.” (SEEA 2012, paragraph 2.17).

187. Some of these assets, such as fossil fuels, metals and minerals, are more easily defined and measured. Other forms of natural capital, such as the oceans, air and ecosystems, while essential to the functioning of the economy, are less well defined since many of their services are not marketed. There are, however, concepts and methods for assessing the contribution of many of these services to the economy.

System of Environmental-Economic Accounts (SEEA)

188. The System of Environmental-Economic Accounts (SEEA) is the statistical framework that provides internationally agreed concepts, definitions, classifications, accounting rules and standard tables for natural capital. The handbook was first produced in 1993 and updated in 2003. The central framework of the SEEA was revised and adopted as an international standard by the United Nations Statistical Commission in 2012. The SEEA framework follows an accounting structure similar to that of the System of National Accounts (SNA) and uses concepts, definitions and classifications consistent with the SNA.

189. The central framework of the SEEA does not cover ecosystems accounts which are more experimental. These are described in other volumes of SEEA which were not yet finalised at the time of preparing the current report. For example, ecosystem accounts are covered in "SEEA Experimental Ecosystems Accounts". These handbooks for the more experimental accounts will not be considered an international standard, but will describe best methods and practices.

Definition of natural capital in the SEEA

190. The SEEA notion of capital encompasses a wide range of natural assets, although the level of international agreement on how to measure these assets varies. For the purposes of identifying the themes relevant for measuring sustainable development, three categories are distinguished:

A. *Natural resources.* The SNA and SEEA handbooks define precisely how these resources should be measured. These handbooks include asset accounts which record, for different types of natural resources, their opening stocks (at the beginning of a year), additions and subtractions (due to extractions, discoveries, re-valuations) and closing stocks (at the end of the year).
B. *Ecosystems*[17]. The SEEA defines ecosystems as "areas containing a dynamic complex of biotic communities (for example, plants, animals and micro-organisms) and their non-living environment interacting as a functional unit to provide environmental structures, processes and functions." (SEEA 2012, 2.21). However, there is not yet an international consensus on the measurement of ecosystems. Work is currently progressing on the definition of experimental ecosystem accounts in "SEEA Experimental Ecosystems Accounts". Such accounts provide links to the SNA and necessarily represent a simplification of ecosystem processes and measures. For example, ecosystem accounts would exclude the measurement of the individual elements that comprise assets: in the same way as individual pulleys, bolts and gears that make up a machine are not represented in the SNA. Therefore, the basic statistical unit for ecosystem accounts is generally the "ecosystem"[18].
C. *Environmental conditions (such as climate, air quality etc.).* The SEEA definition of natural capital explicitly refers to more "naturally occurring components", but the SEEA only covers land, natural resources and ecosystems. In this Report, the boundaries of natural capital are considered even more broadly to include assets such as the climate system, air, marine waters and the ozone layer. While the SEEA restricts itself to the measurement of environmental assets within the economic territory of nation states (SEEA, 5.13), this Report takes a global perspective. The measurement of these types of global assets is more problematic since they are not owned by any national, sub- or supranational entity. Nevertheless, these assets provide benefits to human beings and reflect some of the most important environmental problems of our time (climate change in particular).

[17] "Biodiversity" is sometimes used interchangeably with "ecosystems". It can be understood as richness of species and for the purposes of this report is considered a property of ecosystems.
[18] The precise definition of "ecosystem" as a unit of statistical accounting is still being discussed. the most commonly used definition is that an ecosystem is a homogeneous observable area of surface for which land cover and quality information can be obtained..

5.4.2 The impact on human well-being

Natural resources

191. Natural resources are used in economic processes for a variety of purposes: for providing energy, raw materials, the place where the production process can be carried out (such as land, water), soil and other biological resources for agricultural production, etc. In addition to their use in economic production, natural resources contribute to human well-being directly by providing an environment for living, recreation, leisure, etc.

Ecosystems

192. Ecosystems provide a wide range of use and non-use benefits to humans. The Common International Classification of Ecosystem Services (CICES) developed by the European Environmental Agency (2010) divides ecosystem services into four categories: provisioning services (considered "goods" in other classifications), regulating services (processes that are essential to maintaining ecosystem function), habitat services (those that maintain biodiversity) and cultural services (those that humans find essential to their well-being, such as aesthetic and religious experience)[19]. Each of these four categories includes a number of subcategories detailed in Annex III (Table A3.4).

193. Ecosystem services are often categorised in terms of use and non-use benefits. This classification is important for valuation studies because it helps to assign monetary values to ecosystem services. Figure 5.1 shows the most widely used valuation approach, the Total Economic Value framework (TEV). The United Nations-led initiative "The Economics of Ecosystems and Biodiversity" (TEEB) considers the TEV framework to be a "well- structured way to consider all of the values that an ecosystem provides". For each category, the impact on human well-being can be identified:

Use values

194. In establishing use-values, direct and indirect use values can be distinguished:

Direct-use values include the value of natural resources extracted and the use of land for agriculture, recreation and tourism. The value of recreation and other non-consumptive uses of nature, such as aesthetic appreciation, can also be included among direct-use values. Some direct-use values are part of measured market activity (the value of resource extraction and payments for recreation use for example). Others could be described as providing non-market benefits or having non-market value (the value of aesthetic appreciation for example).

Indirect-use values are those associated with the secondary use of the functions provided by natural resources or the environment (i.e. those benefits not derived from direct consumption). Examples include carbon sequestration, the provision of oxygen, air purification, and ultra-violet radiation absorption.

Option values are those associated with assuring the future availability of resources for one's own possible future use. An example is the value placed on maintaining natural resources as future sources of genetic material for drugs or hybrid agricultural crops.

[19] There is an emerging understanding in environmental economics that these classifications of services do not represent actual services that directly benefit humans or have an impact on human well-being. Many are processes that may better be represented as "intermediate" services or simply conditions necessary for the production of the final services. see Boyd and Banzhaf (2007) for a more detailed discussion.

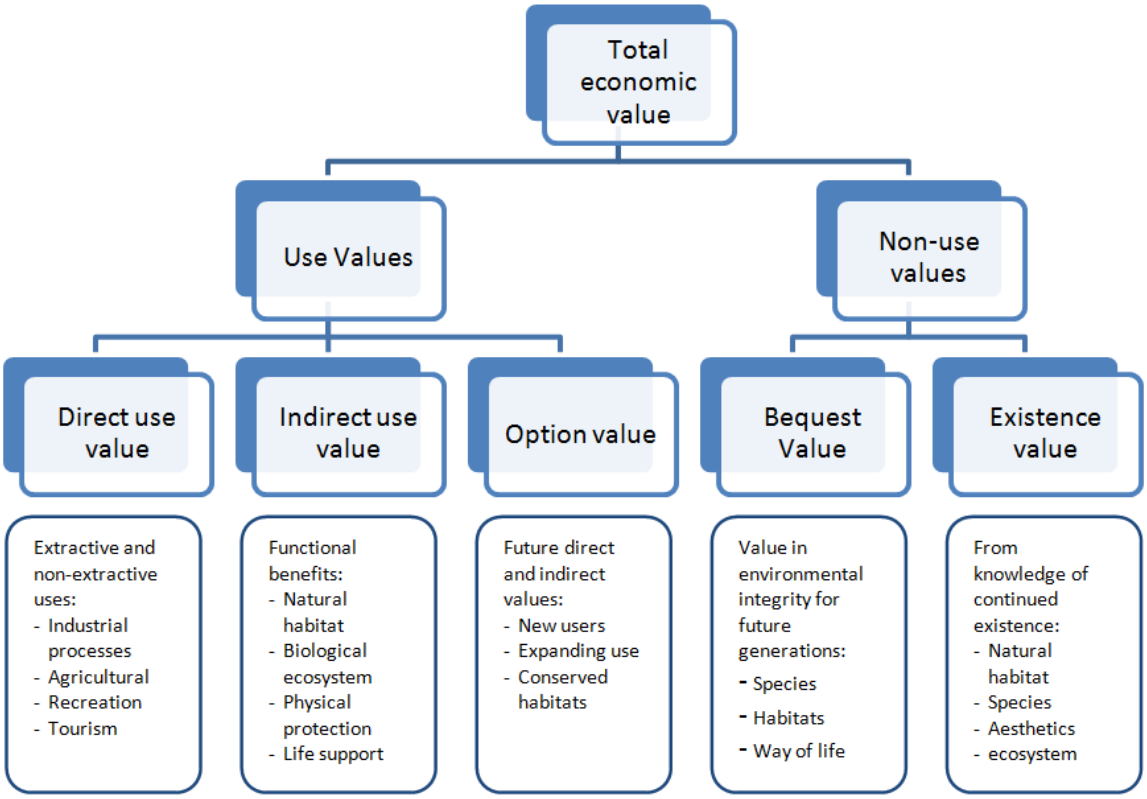

Figure 5.1. Economic values provided by an ecosystem (Total Economic Value – TEV) (Adapted from The Economics of Ecosytems and Biodiversity (TEEB), 2010)

Non-use values

195. For non-use values, a distinction can be made between existence and bequest values:

Existence values are the values placed on (or the benefits obtained from knowing about) the existence of natural resources. They are independent of the use of the resources in question. Existence values can be based, for example, on sympathy for a certain species. Donations to environmental funds that preserve remote environments that most donors are likely never to visit are evidence that existence values are a significant component of resource values.

Bequest values are the values associated with assuring that natural resources are passed on to future generations.

Environmental conditions

The atmospheric system, be it the ozone layer or the climate system, has a major impact on human well-being both now and in the future. Human existence is not possible without the services that they provide. The ozone layer, for example, shields humankind from UV light and the climate system keeps the global temperatures and weather conditions at a level that can sustain the life of humans and ecosystems. The oceans constitute another important natural resource because of the global regulating services they provide.

5.4.3 Physical indicators and valuation

Natural resources

196. In the SEEA assets can be measured in physical or monetary units. The SEEA asset accounts provide information on the opening stock and closing stock in a year and all the additions and subtractions. In the case of minerals, for example, the physical quantities of opening stocks are adjusted by new discoveries and extraction to arrive at the closing stocks. Changes in the value of the stocks take into account changes in the price of the resource and in the cost of extraction. These asset accounts are balanced in both monetary and physical terms.

197. There is an important difference between physical and monetary accounts of non-renewable natural resources. The level of physical assets can increase only if the discoveries exceed the extraction of the resources. However, the value of assets in monetary terms can increase also when prices increase. It is important for users who interpret the monetary asset accounts to understand that the increase in value does not necessarily imply that the physical stock of the resource in question has increased (assuming there are no discoveries); it simply means that the *value* of the physical units comprised in the stock has increased by more than its extraction costs.

198. It is difficult to put a price on unmined metal or oil resources, as it is unknown what their price in the future will be once they are sold on markets. Therefore, the "value" of resources has to be calculated using indirect methods such as the Net Present Value method (NPV) or the appropriation method. The NPV approach, which is favoured by the SEEA, is similar to that used for valuing an annuity: a resource's value is equated to the stream of income that can be generated from extracting it over its useful lifetime. The first step to estimating the stream of income from this natural resource involves calculating the current period's income from extraction. This income, also known as "resource rent", is equal to total revenue received from sales throughout the period minus all costs incurred during extraction. Costs include operating costs, such as fuel and labour, as well as capital costs, such as wear-and-tear on machinery and a normal return to capital. In addition to these costs, pay fees, taxes and royalties to various levels of government should also be considered. These payments, when applied to the resource extraction, implicitly represent rent and are therefore not deducted from sales revenue.

199. In practice, it is often assumed that the quantity extracted, as well as the rent generated from extracting the resource, will remain constant in each successive period until resources are exhausted.

200. A final step in valuation is to calculate the present value of this stream of income. Since any rent that will be received in the future is worth less than it would be if it were in hand today, all future rents must be discounted before being summed together.

Ecosystems

201. The measurement of ecosystems is an area that is currently progressing rapidly. The "ecosystem accounting" described in this section includes both physical and monetary measurement. The process includes three steps:

(1) The extent of the ecosystem ("stock") – based on land use, land cover and additional data (climate, landform, etc.) – and changes thereof are used to define the "statistical unit" or ecosystem.

(2) The quality of the ecosystem is evaluated based on biophysical data (species diversity, pollutants, chemistry, etc.) attributed to the ecosystem[20]. For national accounting purposes, aggregate measures such as quality indices or biodiversity indices provide high-level measures that can be compared with changes in stock and value.
(3) The values of ecosystems are often based on local valuation studies of the ecosystem's services. The values determined for one service in one location are often attributed to a similar service in another location with adjustments for differences in local conditions. Socio-economic data (such as land use, extraction, harvesting, park visitor surveys, etc.) can be applied to determine the value of provisioning services. However, to obtain non-use values, environmental economists typically conduct surveys of individuals to determine their willingness to pay for specific ecosystem services. These values, however often include large portions of consumer surplus, making them difficult to compare to values obtained from market transactions.

202. SEEA 2003 only describes the first step of the accounts: a classification of land use and land cover statistics. SEEA 2003 further suggests that, once areas of land use and land cover (including water) are delineated, quality measures should be assigned to individual areas. Resolution of the statistical unit, i.e. of the size of individual ecosystems, is not discussed in SEEA 2003. Ideally, individual areas should be as small as possible so that they are relatively homogenous and can be aggregated to higher levels for reporting. Since land cover is a useful starting point for defining the statistical unit and, generally, land cover data are derived from satellite images, the actual size of the statistical unit and the frequency of updating the stock account for ecosystems will depend on the resolution and frequency of the satellite data available in various countries.[21]

203. Information already available at this level can be used to produce a number of valuable ecosystem-related indicators:

Change in land cover can indicate the speed at which land cover is being altered by human activities — directly and indirectly. This indicator is usually represented in terms of a land cover change matrix, which shows the opening stock of land cover at the beginning of an accounting period, transformations over the period (e.g. cropland transformed to built-up land) and the closing stock at the end of the period.

The presence of important land cover types (e.g., "virgin" forest, wetlands) can be tracked.

The proportion of area that is protected can be determined.

204. Land cover alone is not sufficient information to delineate ecosystems. Additional information required includes climate, relief, landforms, geology, soil, vegetation, water bodies and fauna.

205. Ideally, a national classification of ecosystems would be coherent with emerging international classifications. The TEEB classification shown in table A.3.3 in Annex III is a modification of the one used for the Millennium Ecosystem Assessment. National classifications of ecosystems may require adjustments to fit with the international classification.

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[20] The Australian approach (Wentworth group, 2010) to ecosystem accounts produces quality measures and aggregates them into a single index.

[21] It is not clear whether both land use and land cover statistics are necessary to define the statistical unit. Although ideally both should be known, land cover is more easily observable from satellites and simpler to aggregate at the national level. On the other hand, land use data are often held in disparate government departments and uses may be overlapping. For example, mining, timber extraction and agriculture may be allowed in a national park. Furthermore, many land use statistics, such as area of cropland, can be estimated from land cover information. Knowing how the land is used is important in instances where the use is not directly observable from satellite such as grassland used for grazing land or parks. Comprehensive national land use data may be burdensome for some countries to compile and the benefits of doing so may be marginal.

206. SEEA 2003 recommends assigning quality measures to individual land cover units. This approach is also appropriate for ecosystems. These include biological measures, such as presence of certain species as well as chemical and physical measures such as water quality, air quality, temperature, pH and levels of natural and artificial substances. Based on these quality measures, indices of biodiversity and resilience of ecosystem health can be derived (see Certain (2010) for Norway and Wentworth Group (2010) for Australia).

207. Apart from the measurement of the land cover and the quality thereof, methods exist and are being refined to measure the economic value of ecosystems. Valuation methods are based on the use and non-use benefits. Figure 5.1 provides a summary of the current understanding of the services that ecosystems supply. Sometimes the benefits will have clear market prices that can be used and sometimes other methods will need to be used. For example, the value of most provisioning services would be based on direct use values. The value of habitat services in terms of maintenance of genetic diversity is an indirect use and may be valued in terms of the cost of substituting for the function.

208. Measures of ecosystem goods and services can be used in several ways. One is to monetise the values and aggregate them into a single measure. Another approach is to use the information to assess trade-offs between alternative uses of the ecosystem. This requires an understanding of the marginal values, that is, how the values would change under different conditions. For this reason, understanding the relationship between the quality of the ecosystem and the value of its services is important. To maintain the flexibility to do both, it is useful to consider ecosystem goods and services both in terms of average and marginal values.[22]

209. A number of methods have been developed in environmental economics to determine use and non-use values. These are summarised in text box 5.2. Some guidance on which methods to use in different situations is provided in de Groot et al (2002).

Box 5.2. Methods for monetising ecosystem services

- Market Price Method: Estimates economic values for ecosystem products or services that are bought and sold in commercial markets.
- Productivity Method: Estimates economic values for ecosystem products or services that contribute to the production of commercially marketed goods.
- Hedonic Pricing Method: Estimates economic values for ecosystem or environmental services that directly affect market prices of some other good. Most commonly applied to variations in housing prices that reflect the value of local environmental attributes.
- Travel Cost Method: Estimates economic values associated with ecosystems or sites that are used for recreation. Assumes that the value of a site is reflected in how much people are willing to pay to travel to visit the site.
- Damage Cost Avoided, Replacement Cost, and Substitute Cost Methods: Estimate economic values based on costs of avoided damages resulting from lost ecosystem services, costs of replacing ecosystem services, or costs of providing substitute services.
- Contingent Valuation Method: Estimates economic values for virtually any ecosystem or environmental service. The most widely used method for estimating non-use, or "passive use" values. Asks people to directly state their willingness to pay for specific environmental services, based on a hypothetical scenario.
- Contingent Choice Method: Estimates economic values for virtually any ecosystem or environmental service. Based

[22] *Marginal* values are significantly more difficult to determine than average values. One approach is to compare the values of services in similar ecosystems but with different levels of quality. For example, a pristine forest may have a higher abundance of species than a forest degraded by pollution and harvesting. A first estimate of the value of the pristine forest if it were degraded in a similar way would be to substitute the values of the already degraded forest. *Average* value of services can be derived from the current levels of exploitation such as the volume of timber or fish harvested. Beyond biophysical quality measures and exploitation data, additional information will be required to assess, for example, cultural or socio-economic importance.

on asking people to make trade-offs among sets of ecosystem or environmental services or characteristics. Does not directly ask for willingness to pay—this is inferred from trade-offs that include cost as an attribute.

- Benefit Transfer Method: Estimates economic values by transferring existing benefit estimates from studies already completed for another location or issue.

Source: http://www.ecosystemvaluation.org/dollar_based.htm (Oct. 29, 2011)

Environmental conditions

210. There is very little agreement about the measurement of assets that are not covered by SEEA central framework and the SEEA Experimental Ecosystems Accounts. It is beyond the scope of this Report to specify all measurement methods for this group of natural assets but, as an example, a brief overview of methods for climate is provided here.

211. The climate system can be measured in either physical or monetary terms. Biophysical indicators include CO_2 concentrations or average temperature. These measures provide insight into the development of the "global capital stock" (for more discussion about global capital see Chapter 6). Changes in these indicators will show how our climate system changes over time.

212. Over the past two decades, many studies have tried to put a price on the damages due to climate change. They do so by using weather projections and estimates of the damages caused by changes in temperature, rainfall patterns and sea-level rises. The total damages are then discounted to the current time to provide total (discounted) costs per ton of carbon (Tol, 2005). These calculations provide global estimates of damages (total depreciation of the natural capital asset). Based on this methodology, costs of climate change will vary across countries (Stern, 2006).

213. Recent studies have started to explore the historical responsibilities of nations by calculating the cumulative emissions and damages attributable to each country since the industrial revolution. For example, Botzen et al. (2008) show results of cumulative emissions between 1900 and 2004 and projections until 2080. They suggest that the United States is responsible for the highest level of cumulative CO_2 emissions, followed by Western Europe, China, Japan and India; the share of China and India will, however, greatly increase in the future.

Measurement challenges

214. The measurement of natural capital has many challenges. This Report has identified a number of directions that need further exploration.

215. *Asset boundaries*. The current Report covers a broader list of assets than is used in the SEEA. In particular, the inclusion of the climate system appears important for any SDI set. Similarly, marine waters outside of the national territory is not be considered an asset in national accounting but should be included as a global asset and accounted for by international agencies as complements to compilations of national reports.

216. *Statistical units*. An accounting system, ecosystem accounts included, requires a basic measurement unit that is defined in a consistent way, can be classified into one category or another, and is relatively stable over time. In the case of economic or social statistics, the statistical units are relatively easily defined. Methods need to be developed to ensure that the statistical unit for ecosystem accounts is consistent over time and across the country, and which is relatively stable over the accounting period.

217. *Critical natural capital/tipping points.* Monetary valuation of ecosystem accounts by TEV (Total Economic Value (TEV)) does not address several important issues with respect to natural capital, such as the concept of critical capital. The term "critical natural capital" refers to a sub-set of natural capital which is non-substitutable and can therefore not be valued. Examples include

stable climate and life-securing ecosystem services, such as the provision of food, raw materials or drinking water. Additional criteria — of a socio-cultural, ecological or ethical nature — can be used to determine whether a natural capital belongs to this category (Brand, 2009). Physical indicators (greenhouse gas emissions, surface temperature) are necessary to gauge the state of these critical capital stocks. Indicators of resilience and tipping points can supplement physical indicators as stated in the TEEB report.

218. A related topic concerns the so-called "tipping points". Where critical biophysical thresholds are reached, crossing them could have disastrous consequences for humanity. Rockström et al (2009), estimate the current position for each of nine "planetary systems": climate change, ocean acidification, stratospheric ozone depletion, nitrogen and phosphorous cycles, global freshwater use, change in land use, biodiversity loss, atmospheric aerosol loading and chemical pollution. Of the seven systems that have already been quantified, the authors contend that mankind is already past the tipping points for climate change, the nitrogen cycle, and biodiversity loss. However, the authors do stress that the way in which the thresholds have been calculated needs further development.

219. *Aggregation/monetisation*. Should natural capital be aggregated into one single measure or be reported as distinct measures? Aggregation is useful since it provides high-level indicators of the quantity, quality or value of natural capital. However, such aggregation implies that all sub-measures should be provided in monetary terms. Such monetisation may be difficult because of the strong assumptions that may be involved (see section 2.3.4 of this Report).

- Attempts have been made to aggregate quantities of natural assets simply by adding their weight (for example, adding tons of coal to tons of timber) for purposes of understanding material intensities of the whole economy. However, aggregation by weight is possible for some similar assets but not for others (OECD, 2008).
- Some countries have made progress in aggregating qualities of natural assets (Wentworth Group. 2010, Certain, 2010), by defining "reference conditions" and then creating indices to measure the distance of a quality measure from that reference condition.
- It is also possible to aggregate the monetary value of natural assets but, as discussed previously, not all natural assets can be easily monetised. There are several controversies around monetization of non-market assets (see sections 2.3.4 and 5.7 of this Report), and even accepted approaches (such as valuing minerals and metals in terms of the net present value of the income stream (resource rent) expected from them) requires assumptions about the future (prices, inflation and discount rates).
- Are national aggregates of quantity, quality or value of natural capital meaningful? The main arguments for monetisation are that (a) it provides a link to the SNA and (b) it provides a means of producing high-level indicators that can be compared with other national socio-economic indicators. Atkinson (2010) argues that, despite the drawbacks of national aggregates, measurement of value of natural capital at the local level is essential to support local land-use decisions. He also argues that it is not the aggregate that is meaningful, but the change in the value under certain conditions that informs decisions.

5.4.4 Selection of themes

220. The natural capital themes proposed in this Report are shown in Table 5.2. Natural resources (energy and non-energy resources) and water (resources) are covered by the central framework of the SEEA, while ecosystems are covered by SEEA Experimental Ecosystems Accounts. Land is covered by SNA. The assets not covered in the SEEA, air quality and climate, are also included as themes though they are not covered in the SEEA. The relationship of this classification scheme with the SEEA is further specified in Annex III.

Table 5.2 Themes of natural capital

Dimension	Sub-dimension	Themes
Capital	Natural capital	NC1. Energy resources
		NC2. Non-energy resources
		NC3. Land & Ecosystems
		NC4. Water
		NC5. Air quality
		NC6. Climate

5.5. Human Capital

5.5.1. Concepts and definitions

221. There are different definitions of human capital. The current Report relies on the definition proposed by OECD that specifies human capital as "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" (OECD, 2001). The notion of capital, in this context, underscores the fact that the people's characteristics impact not only on current well-being but also on people's conditions in the future. In this perspective, human capital is an asset directly linked to individuals (in contrast to social capital, considered in the next section, which refers to interpersonal connections or institutions).

222. Most accounts of human capital distinguish between people's skills and competencies (acquired in school and non-school settings) and their health conditions. On the latter, indicators of current health status (e.g. life expectancy and summary measures of health status that combine morbidity and mortality in a single statistic) are widely used, but these measures do not adequately capture those risk factors that might impact future health outcomes, such as hypertension and obesity. These risk factors, together with a variety of other determinants of heath conditions, are sometimes described as part of the stock of a county's 'health capital' (National Research Council, 2010).

223. While people's health may be regarded as a component of human capital and of the overall capital base of each nation, this concept is not further discussed in this section. Human capital is typically measured mainly from the viewpoint of 'educational capital', that is, people's skills and competencies.

5.5.2. The impact on human well-being

224. In practice, most measurement approaches to human capital are restricted to people's skills and competences, which are often further limited to those obtained in a school setting. Therefore, the main type of human capital investment undertaken by households is through formal education. The educational system contributes to human well-being in the future through higher per capita production and (multifactor) productivity. At the same time, education also matters for the well-being today, as research has shown that persons with higher educational levels enjoy higher levels of life satisfaction, better health, greater opportunities to socialize with others and to participate in the life of their community. Education therefore contributes to both current well-being and to its sustainability over time.

5.5.3. Physical indicators and valuation

225. Human capital can be measured using both physical and monetary indicators (see Figure 5.2). Physical indicators can refer to either the quantity or the quality of education embodied in

people living in a country. Most indicators measuring the quantity of education are constructed with data on the highest educational level attained by people, and expressed in the form of either population shares having attained to various educational levels (e.g. primary education, lower secondary education, upper secondary education, etc.) or continuous measures of the length of schooling (i.e. measures of average years of schooling or measures of school life expectancy of students of a given age).

226. Indicators measuring the quality of education are those based on the assessment of the reading, numerical and science skills of 15-year old students based on the OECD *Programme for International Students Assessment* (PISA); and, for adults, on the OECD *Programme for the International Assessment of Adults Competences (PIAAC*). One limitation of all physical indicators on education is that each of them captures a different aspect of a complex phenomenon, while failing to provide a single comprehensive measure of human capital. Such limitations make it difficult to compare changes in different types of capital stocks.

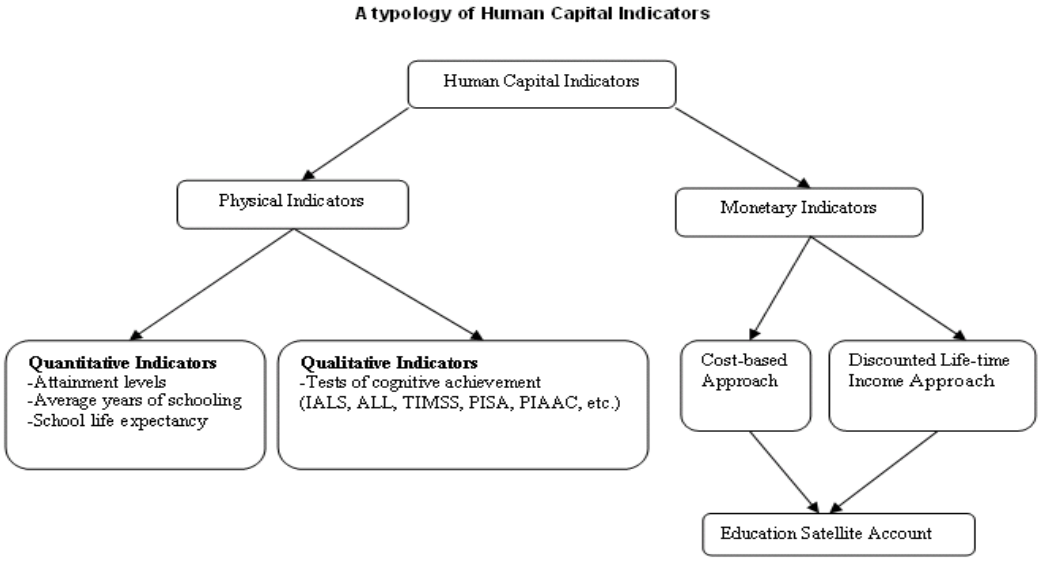

Figure 5.2 A typology of Human Capital Indicators

227. These limits can be overcome through monetary measures of the human (educational) capital stocks. Monetary indicators of human capital can be constructed by looking either at the inputs that enter into the production of human capital (using the cost-based approach first implemented by Kendrick, 1961) or at the outputs that stem from it (using the lifetime income approach pioneered by Jorgenson and Fraumeni, 1987, 1995). While these two approaches are typically considered as opposite to each other, they are two sides of the same coin and, in principle, both inputs and outputs should be included in a more comprehensive educational satellite account with an education production function at its core

The Jorgenson-Fraumeni approach

228. The Jorgenson-Fraumeni methodology estimates human capital from the present and expected future lifetime income of people currently living in each country. Current labour income is assumed to grow at a specified rate in the future (until people reach retirement age), summed over people's lifetime and discounted to the present. In this approach, lifetime income depends upon birth year, as well as current survival rates, school enrolment, educational attainment, wages, employment rates and hours worked.

229. The lifetime income approach can be applied to both market work (based on observed wages of people with different attainment levels) as well as to non-market activities (the time that people devote to care, cooking, education or health related activities) and leisure time. Extending the approach to non-market aspects requires, however, choosing how to value the time devoted to non-market activities and leisure. One possible choice is that of opportunity costs, which values non-market time using the market wage of each person; this approach is typically made operational by using the average wage rate for all individuals born in the same year, of the same gender, and with the same amount of education (Jorgenson and Fraumeni, 1987). Another possibility is that of replacement costs (for those activities that can be delegated to a third party, such as production of household services for own use). Both options are acknowledged to be imperfect proxies for the marginal value of time. Still, they represent a practical alternative to methods that try to construct estimates of the marginal value of time for individuals using breakdowns by gender, age, etc.

230. The different studies based on the Jorgenson-Fraumeni approach differ in terms of scope and methodological assumptions. One attempt to implement the Jorgenson-Fraumeni approach in a comparative setting is represented by the OECD project on human capital. Sixteen OECD countries, two non-member countries and two international organisations participated in the project. The results are described in Liu, 2011. The scope of the OECD project is narrower than the one originally proposed by Jorgenson and Fraumeni. It is limited to market work (excluding non-market activities and leisure time) and to people of working age (excluding the human capital embodied in children and the possibility that elderly people could continue working beyond the age of 65). However, the OECD application of the Jorgenson-Fraumeni methodology has the advantage of relying on categorical (i.e. grouped) data that are available within the OECD statistical system and on comparable assumptions on exogenous parameters made across countries.

231. Measures of the stock of human capital based on the Jorgenson-Fraumeni approach have both advantages and disadvantages. Advantages include the following: i) monetary measures of human capital can be compared to those for other types of capital (economic and natural resources with a known market value) to provide an indication of whether the total capital stock of a country (or a subset of it, when some types of assets are 'critical') is increasing or decreasing; ii) the measures are based on an accounting structure that mirrors the one underpinning the estimates of the stock of economic capital developed within the SNA framework; and iii) the measures allow comparison of the impact of a range of factors (pertaining to demography, the labour market and the education system) that shape the evolution of human capital over time.

232. The human capital measures based on the Jorgenson-Fraumeni approach, however, also have limits. Some are conceptual (e.g. the assumption that the benefits of education take only the form of higher market earnings) or practical (e.g. the limitation of the OECD estimates to people of working age) while others are related to their interpretation, in particular to the possibility that they might provide a "wrong signal" to policy makers. For instance, to increase the total stock of human capital (as measured through the Jorgenson-Fraumeni approach), some countries may prefer to train a few PhD students (whose earnings and employment probabilities far exceed those for less qualified people) rather than provide basic education to all; or they may encourage births of boys rather than girls, simply because the (market) lifetime income of women is lower than the one for men. These 'interpretation issues', however, are not specific to monetary measures of the stock of human capital. Similarly there may be many ways to increase GDP, even through "bad" policies such as demolishing a brand new building and constructing exactly the same once again. In the same way as changes in GDP need to be interpreted in the light of the full range of information provided by the national accounts system, changes in the monetary stock of human capital must be interpreted in the light of other information provided by human capital accounts. Decomposition analysis and inequality measures which can be derived from the human capital accounts may be used to evaluate the societal effects of different types of policies to support human capital accumulation.

5.5.4. Selection of themes

233. In the context of measuring sustainable development, both monetary and physical measures of human capital are needed. Three main reasons suggest the importance of physical measures:

- Data needed to compile physical measures of human capital (e.g. based on people's educational attainment) are already available for the large majority of countries. Conversely, monetary measures of the stock of human capital are likely to remain limited to a handful of countries in the foreseeable future. While, from a sustainability perspective, changes in these quantitative indicators of human capital cannot be compared with changes in other types of capital (i.e. they do not permit assessment of whether the 'capital base' of each country is expanding or contracting), they have proved their value as explanatory variables in regression models attempting to explain patterns of economic growth.
- Qualitative measures of people's cognitive achievements in the form of 'pencil and paper' test scores are expected to become more prominent in the near future (e.g. with the dissemination of results based on PIAAC in 2013). In particular, test scores available at the individual level (results which can be organised in the form of a micro-database): i) provide a direct measure of an important set of people's skills; ii) allow for a more in-depth description of the distribution of performance across individuals within each country, based on a variety of characteristics (i.e. they inform about equity); and iii) allow the assessment of how competencies, for a given attainment level, change with people's age, as a result of obsolescence, adult training and other factors. Integrating these qualitative estimates of people's skills into monetary measures of human capital will be a major task for the years to come, and one where progress may be expected to be slow.
- Opportunities to better capture non-monetary benefits from education may arise in the future. Micro-databases, which link quantitative and qualitative measures of education (e.g. people's educational attainment or their test scores) to measures of people's achievements in other domains provide an opportunity to identify the non-monetary benefits of education better than the Jorgenson-Fraumeni measures, which are not available at an individual level but only by country and for subgroups of the population. The non-monetary benefits of education include those accruing to the individual (e.g. better health) and those accruing to society at large (e.g. better parenting practices, greater openness and tolerance, better functioning of democratic systems).

234. To conclude, the above set of considerations suggests that a 'practical set' of capital-based indicators should include physical measures of human capital (both for education and health) and, when available, monetary measures of human capital. Official statistical systems should be encouraged to develop better physical measures of education and to produce monetary measures of human capital on a regular basis. Both types of measures have a critical role to play in assessing both the sustainability of development across countries and inequalities within countries. While the measurement of human capital in the past has been mostly a research topic, a survey carried out in UNECE and OECD member countries in May 2012 showed that several statistical offices are including these results in their statistical publications and a few publish them as official statistics. At the same time, the limited coverage of existing monetary measures (typically limited to the working age population and to market activities) does not allow to make use of the full potential of human capital data for analysing whether a county is on a sustainable path. A more comprehensive approach, which takes into account all aspects of human capital from a sustainability viewpoint, is needed.

235. Both education and health can be seen as quality characteristics of the labour force and of human capital. Therefore, in addition to the quantity of labour, education and health are included as human capital themes.

Table 5.3 Themes of human capital

Dimension	Sub-dimension	Themes
Capital	Human capital	HC1. Labour
		HC2. Education
		HC3. Health

5.6. Social capital

5.6.1. Concepts and definitions

236. Social capital relates to the quality of inter-personal relationships. Where repeated and positive interactions take place between people, trust is built up. In addition, these interactions, among others, contribute to maintain those vital norms and values which are important for the proper functioning of societies.

237. The importance of repeated inter-personal relationships and of networking is strongly stressed in sociological literature. Bourdieu (1986) defined social capital as an individual asset: in his view, individuals participate in social networks in order to improve their competitiveness vis-à-vis others. Conversely, Putnam (1983 and 1995) points at the collective characteristics of network creation.

238. Originally, the sociologically inspired literature strongly emphasises network creation as the main aspect of social capital. On the other hand, Fukuyama (1995) put more emphasis on the trust that is accumulated within these networks. In this perspective, social networks are not a goal in themselves but rather a means on the basis of which individuals are able to build trust with each other. Putnam describes social capital as a necessary lubricant of society, while Woolcock (2001) sees trust as a result of people's investments in social capital. Other authors conceive trust rather as a component of the shared norms and values which stem from social capital, while Cote and Healy (2001) stress the dynamic interdependency between social capital and trust. The direction of causation between networks and trust is obviously complex. On the one side, a basic level of trust is needed before individuals invest in the creation of networks. On the other, the deepening of these networks will lead to an increase in the level of trust between the participants. In some cases, this trust may extend to all members of a given community, even to people they do not personally know. It such a case, one can say that 'generalised trust' has truly been built.

239. Essentially, the discussion on networks versus trust is linked to an underlying, and more fundamental, question of whether social capital should be seen as an individual asset, or rather as a collective, public good. Dasgupta (2003) argues that social capital should be defined as a system of interpersonal relationships and emphasises the importance of external effects. When the effects of network creation primarily impact on the individual level, he suggests using the term human capital. However, when there are large spill-over effects, one can speak of social capital. Dasgupta compares the latter form of capital with Multi Factor Productivity (MFP), a measure of economic efficiency. When repeated interactions between individuals create generalised trust and strengthen shared norms and values, these externalities result in a decline of transaction costs which enables the social system to function more smoothly.

240. Some researchers argue that social capital also manifests itself in the institutions of society. From this point of view, institutions are a sub-set of social capital. Other approaches see institutional capital as a separate phenomenon. In this Report, both views are regarded as equally valid. For practical reasons, the indicator set which is presented in chapters 7 and 8, includes institutions as a theme of social capital rather than as a separate category.

5.6.2. The impact on human well-being

241. There are three channels through which social capital may affect human well-being:

- The creation of social networks may have a direct well-being effect as individuals who are strongly embedded in societal networks tend to be happier and more satisfied with life than those who are less integrated in society;
- Social capital can stimulate increases in other types of capital;
- Due to network externalities, social capital formation may lead to increases in efficiency and declines in transaction costs.

The direct well-being effects of social participation

242. Social production function literature shows that social participation has a direct well-being effect (Lindenberg, 1989; Ormel et al., 1997). The social production function builds on the basic notion that individuals produce their own well-being. Van Bruggen defines some first-order goals that individuals aim to achieve in order to increase their well-being. In the definition of the main goals, a broad concept of well-being is used. In addition to the aspects which belong to the traditional utility function (such as the consumption of goods and services), the quality of social networks – and the well-being that individuals derive from them – is included.

243. Forming a network may have beneficial effects to those who are part of it. However, there are always people who are excluded. Following Gitell and Vidal (1998), a distinction can be made between 'bonding', 'bridging' and 'linking' capital. From a well-being perspective it is important to include networks in the measurement of social capital that aim to connect different groups in society, as these networks can be expected to generate high levels of generalised trust and may have the highest impact on the well-being of society as a whole.

The impact of social capital on the accumulation of other capital stocks

244. Grootaert (1997) argues that social capital becomes most valuable when linked to other forms of capital. Not only does social capital stimulate the accumulation of the other forms of capital (economic, human and natural capita) but it also increases their productivity. Social capital may stimulate the accumulation of other types of capital in the following ways:

- *Labour*: Granovetter (1975) points at the importance of social networks in facilitating job search and reducing unemployment;
- *Economic capital*: The literature on national systems of innovation (Lundvall (1992), Edquist (1997) as well as Soete and Freeman (1997) shows that co-operation between firms, as well as between firms and universities, stimulates the creation and diffusion of knowledge. In the case of the Netherlands, the relatively low levels of R&D intensity are partly explained by weakly developed knowledge networks (Gelauff, 2001), whereas in the case of Finland, strong linkages between different actors in the knowledge economy lead to high levels of innovation (Lisaka, 2006);
- *Human capital*: Teachman et al (1997) stress the importance of social capital in the process of human capital formation. Coleman (1988) also emphasised the importance of parents in the education of their children. The better the contact between parents and children is, the better the children perform at school. Conversely, human capital may also stimulate the accumulation of social capital. Halpern (1999) and Putnam (2000) consider education as an important determinant of social capital, as the norms and values that children develop at school will enable them to properly participate in society as adults. There is also ample evidence that higher levels of social capital have a favourable impact on people's health status (Lomas 1998; Elliot 2001).

- *Natural capital*: By creating networks where environmentally friendly norms and values are built up and the over-exploitation of non-renewable resources is checked, a more sustainable use of natural resources can be achieved (Ostrom and Ahn, 2001).

The effect of social capital on general socio-economic efficiency

245. The most far-reaching impact of social capital stems from network externalities. Therefore the concept of social capital should not be restricted to the quantification of social networks but pay due attention to the trust that is being built up in these networks. Halpern (1999) argues that transaction costs may reduce as the levels of social capital increase. Generalised trust and the creation of commonly shared norms and values may result in informal sanctions on the breach of promises.

246. These informal checks on the behaviour of actors have proved to be far less costly to enforce than institutionalised transactions based on contracts, formal sanctions and legal systems (North, 1990). According to Fukuyama (1995), the 'informal' contacts that generalised trust creates prove to be a less costly alternative than by enforcing formal, institutionalised contracts. Durlauf and Fafchamps (2004) point at other efficiency-enhancing effects of social capital, such as the sharing of information and the creation of group identity, which facilitates social and economic transactions.

247. The political economy literature has also emphasised the importance of good relations between state and society (Alesina en Rodrik, 1994; Drazen, 2000). Acemoglu et al (2004) built a model in which favourable growth paths are linked to societies with a balance of power between state and society that ensures that there are enough checks and balances to force the state to focus its policies on society as a whole, instead of favouring only a limited number of social groups. These theoretical notions can also be demonstrated empirically. For example, Evans (1996) shows that harmonious state-society relations are an important factor of the economic success of many of the East Asian countries.

248. The idea that institutional quality can be conceived as a form of capital may come as a surprise to some. However, De Soto (2000) offers powerful arguments to support this idea, on both theoretical and empirical grounds. He shows how much time and financial resources are lost due to institutional rigidities and a lack of trust in society. Measures of "institutional quality" are therefore integral to any assessment of sustainable development (Mira d'Ercole and Salvini, 2005). Box 5.3 pays special attention to the importance of cultural activities, as citizen's participation in such activities can play an important role in the building-up of social capital.

Box 5.3. The importance of cultural activities

Participation in cultural activities may be regarded as an important component of social capital. International studies such as the 2002 and 2007 Euro barometers measure participation in cultural activities e.g. covering the visit of cultural institutions, the use of written or audiovisual media, and one's own cultural activities undertaken as an amateur[23].

The participation in these activities contributes in many ways to build up, consolidate and develop social capital. Visiting cultural institutions leads to physical encounter with, and immersion into, social groups. This experience favours interaction and networking, as well as trust building. Informal checks on the behaviour of actors are thus enabled and overall transaction costs in social life may be reduced.

More fundamentally, visiting museums or exhibitions, libraries or attending spectacles such as theatre plays, concerts, films and visiting cultural heritage, bring people into contact with the shared norms and values of society. According to Castoriadis (1977), this is crucial for building social identity and cohesion.

[23] The word "culture" is used here not as a synonym of "social", but in its narrow sense referring to the production, distribution and consumption of cultural goods.

Participation in cultural activities also allows individuals to link their individual and collective identity. It can also stimulate the accumulation of other forms of capital, such as knowledge. As cultural institutions are often public, they contribute to consolidate the ties between the citizens and the state or its institutions. Moreover, media in its various and expanding forms establish local but also worldwide social networks and audiences (TV, radio and, most notably, Internet) and contribute to form social capital.

Finally, cultural activities by amateurs, such as singing in a choir, playing an instrument in an ensemble or taking dance lessons, strongly contribute to network building, and their importance tends to increase with population ageing. Kushner and Cohen (2009) show a rise in the percentage of people creating art (music, drawings, etc.) as amateurs in the United States. These activities often lead to local, high quality relations which favour intergenerational crossover and reduce distance between social groups. This contributes to increasing and diversifying people's overall social capital.

In the end, cultural activities plays an important part in social capital and contributes to the accumulation of economic and human capital as well as to the well-being and the general socio-economic productivity of the population. Cultural participation is therefore an important element in building up and preserving society's social capital.

5.6.3. Physical indicators and valuation

249. Social capital is almost exclusively measured in physical units. The monetisation of social capital seems to be out of reach for the foreseeable future. The only indirect way to provide monetary estimates is presented by the World Bank in its (residual) measure of wealth from human resources, which implicitly includes both social and human capital. This method is described in more detail in the next section. One possible way of monetising social capital could be by using time use surveys to measure the time that people spend in building networks with others and applying opportunity costs for the different activities related to social capital. However, calculating a (monetised) social capital stock is a daunting task in the light of data restrictions and of the strong assumptions that are necessary to make such calculations.

5.6.4. Selection of themes

250. The definition of social capital used in this report refers to the trust between citizens, as well as to characteristics of institutions. There is quite some debate as to whether formal institutions should be included in the social capital concept or not. This Report follows the capital categorisation as proposed by the WGSSD, but acknowledges that some may prefer to label institutions as a different type of capital, instead of a sub-set of social capital.

Table 5.4 Themes of social capital

Dimension	Sub-dimension	Themes
Capital	Social capital	SC1. Trust
		SC2. Institutions

5.7. The limits of monetisation

251. The capital approach is based on a rich body of literature, spanning a period of more than half a century. Still, capital measurement in monetary terms has its drawbacks. Some words of caution are therefore needed when using monetary capital estimates in a sustainable development framework.

252. Monetisation techniques often rely on strong assumptions, which may be acceptable from an academic perspective but may appear arbitrary from the perspective of official statistics.

253. Most monetisation techniques that are based on market prices depend on four types of assumptions:

- *Market prices and the functioning of markets*. In most cases, market prices are used for the valuation of capital stocks. This approach is based on the assumption that market prices are determined in a perfectly competitive market. [24]
- *Weak sustainability*. The use of market prices implies that there is perfect substitutability between the various stocks of capital, and that their relative scarcity is reflected in their prices. This weak sustainability perspective is, however, opposed by those who argue that the possibilities for substitution between different capital stocks are limited. Some categories of natural capital stocks are often regarded as irreplaceable (CES, 2009, page 56-57). In that case, summing up all types of capital in one indicator may yield results which are difficult to evaluate from a sustainable development perspective. For example, this overall indicator may show growth because a decline of critical capital is compensated for by increases in non-critical assets (see also the discussion in section 2.3.4 of this Report).
- *Discount rates*. To value capital, future income streams must be discounted and then summed up. Debate over the appropriate discount rate has a long history. The Stiglitz-Sen-Fitoussi report also discusses the ethical aspects of discounting over the generational boundaries. This assumption is empirically important because small differences in discount rate can make a large difference to the monetary value of the capital stock.
- *Technical progress*. To estimate future income streams, assumptions are commonly made about productivity growth in the coming years or even decades. Assumptions also have to be made about the lifetime and efficiency profiles of the capital stocks in future. These predictions are difficult to make and sometimes arbitrary.

254. These points suggest that monetisation techniques often depend on arbitrary assumptions. While some of these assumptions are implicitly used for the monetisation of market capital (national accounts measures of the stock of economic capital are critically shaped by them), some statistical offices may be reluctant to apply them to capital stocks that are not traded in the market place.

The World Bank approach

255. In order to assess the potential of future generations to pursue their well-being, information is needed on the changes in the stocks of economic, natural, human and social capital. When these stocks are measured based on a common metric and assumptions are made about the substitutability of various capital stocks, changes in the total stock of wealth (per capita) will provide information on the sustainability of the development path of each country. The statistical approaches described earlier in this chapter aim to improve the measurement of the types of capital that make up the total wealth of each country.

256. Unfortunately, there is no dataset for a large group of countries where all the different types of assets are measured through a common metric (i.e. in monetary terms). The only dataset which comes close is the one compiled by the World Bank (2003, 2006 and 2011). The World Bank has developed monetary estimates of 'total wealth' for approximately a small number of countries, with additional information on economic and natural capital, for the period from 1995 to the present.

257. Based on these monetary estimates of total wealth, the World Bank computes the so-called genuine saving rates – a summary measure of sustainability. Genuine saving rates show the extent to which society is depleting its total resources (when negative) or adding to them (when positive).

[24] The WGSSD report notes that the functioning markets rarely achieve the ideal conditions economists impose upon them in their valuation methods (CES, 2009, pages 54-55, box 3). The Stiglitz-Sen-Fitoussi report also acknowledges that the right valuation of the stocks of capital is often problematic, in particular "when market prices for assets are not available or subject to bubbles and bursts" (Stiglitz-Sen-Fitoussi report, recommendation 3, §24). It states that "the monetary approach requires imputations and modelling which raise informal difficulties" (Stiglitz-Sen-Fitoussi report, recommendation 11, §38).

258. The term 'genuine' was coined by Hamilton to stress that the relevant flows include investments not just in the conventional economic capital, but also in natural, human and social capital (Hamilton 1994). In the World Bank accounting framework, total wealth is defined as "economic capital minus net depreciation of natural capital plus investments in capital from human resources (where this last term captures human, institutional and social capital)".

259. The intellectual roots of the genuine or adjusted savings approach go back to Fisher (1906) who argued that income can be seen as a return to wealth. Building on this tradition, Solow (1974) and Hartwick (1977) developed a model of an economy that exploits non-renewable resources, looking at the conditions needed to maximise the present value of peoples' well-being (or social welfare) over time, given a set of simplifying assumptions. In this model, non-declining well-being requires that society invests in renewable resources an amount equivalent to the depletion of its non-renewable resources.

260. In the World Bank approach, the total wealth is measured as the discounted sum of consumption expenditures over a period of 25 years (a proxy measure of the years between two successive generations) in the future. As argued in Chapter 4, the concept of human well-being used in this report is much wider than consumption. Therefore, in the perspective of this report, the monetary estimates of *total* wealth developed by the World Bank exclude *all* the non-economic benefits of the different types of capital and are therefore not suitable for measuring sustainable development in the sense described in the current Report.

261. The World Bank estimates provide fascinating insights into the changes in the total wealth of nations, and interesting measures to chart the inter-generational aspects of sustainable development. However, these estimates also raise a number of methodological issues, which are discussed in more detail below.

262. The World Bank dataset distinguishes several types of assets. These assets are produced capital (machinery, structures and equipment); natural capital (agricultural land, protected areas, forests, minerals and energy); and intangible capital. The intangible capital (also labelled as "wealth from human resources") is calculated as a residual and implicitly includes measures of human, social and institutional capital, e.g. the rule of law and governance. In most of the analysis, net foreign assets, i.e. the balance of a country's net financial assets and liabilities, are also implicitly included in intangible capital.

263. While ingenious, the measurement technique used by the World Bank implies that estimates of intangible capital include (i) those assets that were not (properly) taken into account in the measurement of economic and natural capital (such as diamonds, platinum, fisheries and ground water, which are not included in the estimates of natural capital); (ii) any error in the measurement of (tangible) economic capital; and (iii) the effects of specific assumptions made when estimating total wealth. These considerations suggest that the empirical underpinning of the residual measures of intangible wealth is still weak. In countries where direct measures of human capital are available, these estimates may not always be in line with those based on the residual approach used by the World Bank. In other cases, these estimates would imply that social capital provides no (economic) benefits, even though empirical literature stresses its importance for economic growth (Knack and Keefer, 1997). Some more fundamental criticism on the World Bank approach, especially focusing on how these measures can be misleading in the assessment of sustainability, are put forward by Dietz and Neumayer (1999).

264. Overall, it can be concluded that the World Bank estimates are of great importance. A lot of data has been gathered, and this project has given a stimulus to the research into capital measurement. However, much remains to be done to make these residual estimates more reliable (Ferreira, Hamilton and Vincent, 2008).

CHAPTER 6. MEASURING TRANSBOUNDARY IMPACTS

6.1. Concepts and definitions

265. Globalisation makes it increasingly important to take into account the international dimension of sustainable development. The Brundtland report (1987) argued that countries have an obligation to contribute to the eradication of global poverty. The importance of contributing to poverty reduction in developing countries is a recurrent theme in many SDI sets, and provides the rationale for the inclusion of measures of official development assistance (ODA). However, reducing global poverty is not the only cross-boundary issue relevant to sustainable development, and ODA is not the only means to contribute to well-being 'elsewhere. In this Report, a broader view is taken of how the development paths of different countries impact on each other in the context of sustainable development.

266. In section 3.3, the channels through which countries may affect the human well-being of other countries were described. The most important of these are financial transfers, imports of goods and services, migration and knowledge transfers (Figure 3.2).

267. Especially since the publication of the Brundtland Report the literature of sustainable development has strongly focused on international differences in human well-being, often closely linked to the depletion of natural resources. In the remainder of this section, a short summary of these measurement issues is discussed. While other aspects of the transboundary impacts are also important, measurement is less advanced and therefore they are not covered here in detail. The concluding section discusses opportunities to expand the range of indicators in this field.

268. The Brundtland report argued that, to achieve global sustainable development, poverty on our planet needs to be reduced, and that this goal is a collective responsibility of all countries. This goal is still relevant today. Many organizations have justified the inclusion of indicators for Official Development Assistance (ODA) in their SDI sets based on the argument that ODA is one of the most important means though which donor countries can contribute to this goal. The type of poverty discussed by the Brundtland report is the 'extreme' or absolute poverty included in the Millennium Development Goals. This poverty is conventionally defined by the number of people living on less than 1-2 dollars per day, and is mainly concentrated in developing countries.

269. There are, however, several ways in which developed countries may affect the least developed countries. ODA is one specific form of financial transfers (see Figure 3.1), but importing goods and services might also help developing countries to boost economic prosperity and reduce extreme poverty.

270. However, foreign trade does not necessarily have beneficial effects for the well-being of people living in developed countries, and particularly for the poorest people. For example, the import of natural resources from countries with poor institutions sometimes means that the returns on the natural resources do not benefit the general population of a country. This is sometimes referred to as the "resource curse".

271. Of course, when it comes to the transboundary impacts of sustainable development, the depletion of natural resources deserves special attention. Increasing trade in goods and services implies that countries are affecting the resource use and greenhouse gas emissions abroad. Global trading patterns are changing, and several suggest that there are important shifts in how international trade impacts on natural capital. These phenomena have been extensively investigated in the literature. "Carbon leakage" is the term used to describe the mechanism whereby carbon emissions can be reduced in a country by shifting from domestic production to importing products that are CO_2 intensive (Peters, 2008, Weber et al, 2008; Peters and Hertwich, 2006/2008; Babiker,

2005). The "pollution haven hypothesis" and the "race to the bottom hypothesis" postulate that pollution-intensive production will shift toward countries with the lowest level of environmental regulation (Eskeland and Harisson, 2003;Cole, 2004). Overall, there is considerable empirical evidence suggests that "rich" countries are exporting their environmental pressures abroad.

272. Besides, the growing popularity of "footprint" indicators has stimulated interest in the transboundary impacts. "Footprint" is a generic name used for an indicator that analyses the environmental pressures that are generated in the life cycle of product(s) for consumption.

273. The term "footprint" is often associated with the "ecological footprint" indicator (Rees, 1992, Wackernagel and Rees, 1996). This specific indicator calculates the environmental impacts of consumption by looking at the land use required to offset them. The approach has, however, also been applied to other environmental issues, and it is this more general approach that is adopted here. The calculation of the ecological footprint is also controversial (van den Bergh and Verbruggen, 1999; Grazi et al., 2007; Fiala, 2008): as the ecological footprint measures include estimates of the hypothetical area of forests needed to compensate for greenhouse gas emissions, i.e. any increase in greenhouse gas emission not offset by a larger forest area will lead to a higher ecological footprint.

274. Footprints have been calculated for carbon emissions, water use and biodiversity. All these measures have the life cycle of a product as their starting point. Such a life cycle can take place within or outside the borders of the country considered. The footprint of a country in terms of its (GHG) emissions can then be represented by the following equation:

Environmental emission embodied in domestic consumption (footprint) = Emissions from domestic production + Environmental emission embodied in imports – Environmental emission embodied in exports

275. In other terms, the footprint measure includes both emissions from domestic production and those "embodied" in the products that are imported. The emissions embodied in exports are subtracted, because these will be an input for consumption in other countries[25]. The environmental trade balance is usually calculated by the following equation:

Environmental trade balance = Environmental emissions embodied in imports – Environmental emissions embodied in exports

276. Although the conceptual descriptions of the footprint and environmental trade balance given above seem straightforward, in practice the computation of these measures is hindered by many methodological problems and data issues:

- *Differences in footprint assumptions*. The carbon footprint, ecological footprint and water footprint have been developed independently by different researchers for different users and according to different methodologies. Some of these differences relate to the environmental issue that is being investigated. For example, the calculation of water footprints requires a number of assumptions about what constitutes water "consumption". In other cases, the methodological assumptions have simply not been harmonized (see for example, the next two

[25] A footprint indicator uses the "consumption perspective". It is based on the ethical standpoint that the final consumer is responsible for all emissions in the life cycle of a product. The "production perspective" takes the standpoint that a country is responsible for the emissions from all the production of goods and services (even if they are exported). For a discussion of both methods see Peters, 2008; Peter and Hertwich, 2008; Lenzen and Murray, 2010. Many policy targets are similar to the latter approach. For example, the emission targets of the Kyoto protocol are based on the co_2 emissions from within the geographical borders. This is not identical but fairly close to the production perspective. Some authors argue that policy targets should be based on the consumption perspective (Peters et al, 2011).

bullets). Recently, an EU funded project (OPEN-EU) compared and made suggestions for the harmonization of the various footprint methodologies (Galli et al, 2011; Weinzettel et al., 2011).

- *Upstream effects*. The production life cycle of a product can be truncated at various points. Take for example the water footprint of a flower. To cultivate the flower a certain amount of water will be required, either through irrigation or natural sources. This is known as the direct input. However, the agricultural production process requires many other inputs such as machinery, fertilizer and seeds. In turn, the production processes of these inputs require water, but also intermediate inputs which in turn require more water, and so on. The flower therefore provides an impulse to an (in theory infinite) amount of production processes through these indirect effects. Some footprint calculations consider only the direct effects, while others asses the whole life cycle (see next bullet).
- *Input-output models.* Input-output analysis is increasingly being used for footprint calculations because it can evaluate both the direct and indirect environmental pressures. These calculations, however, require a multiregional input-output (MRIO) table, which is presented in a simplified form in Table 6.1. An MRIO table shows all the transactions between industries and consumers of different countries, as well as the primary inputs and environmental pressures. Even when the same basic data are available, several variants of the input-output model can be adopted. It is beyond the scope of this chapter to clarify all the methods, but some of the more prominent examples are the Emissions Embodied in Bilateral Trade (EEBT) model and the full and partial MRIO models.

Table 6.1. Multiregional input-output (MRIO) table with environmental extensions

		Country A			Country B			Country C			Total Output
		Industry 1	Industry 2	Consumption	Industry 1	Industry 2	Consumption	Industry 1	Industry 2	Consumption	
Country A	Industry 1										
	Industry 2										
Country B	Industry 1										
	Industry 2										
Country C	Industry 1										
	Industry 2										
	Value added										
	Total Input										
	Emissions										

277. These types of footprint indicators based on input-output tables are increasingly being adopted by statistical institutes and government agencies[26]. This development is expected to increase in the future, as the availability of MRIO data is increasing (see Table 6.2 for a summary of information on a number of important databases).

[26] Examples include Statistics Canada, 2012; Rørmose et al, 2009; Eurostat, 2012; Lenglart, 2010; Destatis, 2010; Edens et al, 2011; Statistics Netherlands, 2010; 2011; Statistics Sweden 2003; Nijdam et al., 2005; Wilting and Vringer, 2009; Wilting, forthcoming; Defra, 2012; Wiedmann et al, 2008. For an overview of the work at national statistical organizations and government institutes, see Hoekstra et al., 2012.

Table 6.2. Multiregional Input-output (MRIO databases)

	GTAP	EXIOPOL/ CREEA	WIOD	EORA	OECD
Full name of the database	Global Trade Analysis Project	EXIOPOL: Externality data and input-output tools for policy analysis CREEA: Compiling and refining environmental and economic accounts	World Input-Output Database	-	-
Institute	Purdue University	EXIOPOL: EU FP6 project lead by Fondazione Eni Enrico Mattei (FEEM) CREEA: EU FP7 project lead by TNO, Netherlands	FP7 project lead by the University of Groningen	University of Sydney	OECD
Years	1997, 2001, 2004, 2007 (data for different years are not comparable)	2000 (EXIOPOL) 2007 (CREEA)	1995-2009	1990-2009	1995, 2000
IO tables in prices of previous year	-	-	Yes	-	-
Countries/Regions	66-129 (depends on year)	43 (27 EU, 16 non-EU) (95% of the global GDP)	35 (27 EU and 12 non-EU) (80% of world GDP in 2006)	187	41 (90% of global GDP) (67% of global population in 2000)
Industries	57 sectors	130	37	100-500 sectors	17
Environmental data	Greenhouse gases (CO_2, NO_2, CH_4) Energy use Land use (split agro-ecological zone)	Emissions (56) Materials (96) Land use (15) Water use (14)	Energy use / several energy carriers Water consumption Land use Emissions of greenhouse gases Air pollutants Resource use/extraction Generation and treatment of various types of waste	Greenhouse gases Air pollution Water use Ecological Footprint	CO_2
Reference	Narayanan and Walmsley (2008)	Tukker et al. (2009)	University of Groningen (2010)	Lenzen et al. (2010)	Ahmad and Wyckoff (2003) and Nakano et al. (2009)
Website	www.gtap.agecon.purdue.edu	www.feem-project.net/exiopol/ www.creea.eu/	www.wiod.org	www.worldmrio.com	-

Measurement issues

278. The transboundary impacts of sustainable development are much broader than the impact of each country on the human well-being in general, and of the natural capital in other countries in particular. However, indicators apt to measure other aspects of the international dimension are still rare. There are a number of areas which would benefit from further development of indicators:

- Brain drain/brain gain. Countries with lower income levels may have trouble keeping their highly educated population from emigrating to countries with better economic opportunities. This phenomenon sometimes provokes a chain reaction where countries with higher income levels attract the workforce from countries with lower income levels who in turn fill the vacant jobs with immigrants from poorer countries.
- Knowledge transfers. Knowledge spillovers may constitute an important component of productivity increases in a country. The knowledge transfers may happen through movement of human capital, technology embodied in imported capital goods, cooperation in international R&D, etc. But it can also take place illegally through pirated software, patents, etc.
- International financial flows. The current financial crisis has shown that international financial relationships are an important aspect of economic sustainability. Also, foreign direct investments and migrant remittances play an important role in the relationships between countries.
- International institutions. Truly "global" capital stocks are the international institutions that regulate the ways in which countries trade and interact with each other. Although their impact on human well-being is difficult to assess, more methodological research on indicators would be welcome. Only the Swiss SDI set has an indicator for multinational treaties which might be considered an indicator about international institutional capital.[27]

6.2. Selection of themes

279. Table 6.3 shows the themes for the transboundary impacts that are used in the remainder of this report. TI1 will contain indicators that show how developed countries may affect the income levels in other countries. Indicators would include ODA and imports from developing countries. The impact on natural capital elsewhere is covered in themes TI2-TI6. Themes that are related to the issue raised above are brain drain (TI7); knowledge transfers (TI8 and TI9); international financial flows (TI10) and international institutions (TI11).

280. Table 6.3 shows that the indicators can be split into regions. The relevant region may vary significantly per indicator. For example, ODA by definition, is only provided to developing countries. On the other hand an issue such as carbon leakage should not focus only on developing countries, because CO_2 emissions have been shown to shift towards economies such as China. More research is needed in identifying the relevant spatial scale for the indicators of transboundary impacts.

[27] The Swiss SDI set includes themes and indicators, which concerns the transboundary impacts (called Globo in the Swiss-set): http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/02/02.html

Table 6.3. Selected themes of the transboundary impacts

Dimension	Sub-Dimension	Theme	Region/ country A	…	Region/ country B	Developing countries
Transboundary impacts	Consumption and income	TI1. Consumption and income				
	Natural capital	TI2. Energy resources				
		TI3. Non-energy resources				
		TI4. Land and ecosystems				
		TI5. Water				
		TI6. Climate				
	Human capital	TI7. Labour				
	Economic and financial capital	TI8. Physical capital				
		TI9. Knowledge capital				
		TI10. Financial capital				
	Social capital	TI11. Institutions				

PART III. SUSTAINABLE DEVELOPMENT INDICATORS

281. This part of the Report proposes a set of sustainable development indicators based on the theoretical and conceptual principles discussed in Parts I and II. Three indicator sets are provided: two variants of a "large set" (including 90 and 60 indicators, respectively) as well as one "small set" of 24 indicators. The latter set includes the indicators most commonly used by statistical organizations for measuring sustainable development. The data required to compile these indicators are, generally, widely available.

282. This part of the Report is aimed at statistical offices and sustainable development agencies that would like to build up or revise their SDI sets. It can also be of use for policy makers when exploring how to monitor the impact of policies or strategies targeting sustainable development objectives. Finally, it can also be useful for those with an interest in international comparisons of sustainable development, by highlighting where comparable data are likely to be available.

283. Chapter 7 provides the SDI framework that builds on the conceptual model presented in Part I (Chapters 1-3) and the measurement literature discussed in Part II (Chapters 4-6). The framework integrates the conceptual and measurement aspects related to the three sustainable development dimensions discussed in this report, i.e. 'here and now', 'later' and 'elsewhere', as well as the "thematic categorisation" of 19 sustainable development themes.

284. Chapter 8 presents the indicator sets proposed by this Task Force. The two large sets are derived using a step-by-step approach, based on conceptual considerations, analysis of SDI sets and data availability. These indicator sets are assessed in the context of the quality standards typically used by producers of official statistics and international organizations. The data availability of the proposed indicators has been analysed for 46 countries (EU and OECD member countries as well as Brazil, Russia, India, Indonesia, China, and South Africa).

CHAPTER 7. A FRAMEWORK FOR SUSTAINABLE DEVELOPMENT INDICATORS

7.1. The framework

285. The framework for measuring SDI presented in this Report includes the three conceptual *dimensions* derived from the theory presented in Part II: human well-being ('here and now'), capital ('later') and the transboundary impacts ('elsewhere'). These three dimensions represent the so-called conceptual categorisation.[28] In addition, the framework includes the 20 themes presented in Part II. The conceptual and thematic categorisations are explained further in section 7.2.

286. The framework is generic, but this does not imply that all themes are equally important for all countries. It should be also noted that this generic framework does not necessarily lead to a common set of sustainable development indicators. The choice of indicators may differ between countries. For example, an indicator on fossil fuel resources under the theme "energy" will be useful only for countries that have such resources. This does not make the energy theme redundant, because other aspects of energy use may be relevant for other country.

287. Although the proposed framework does not result in identical SDI sets for all countries, it enables a certain level of harmonization by introducing a common underlying structure and a comprehensive set of themes.

7.2. Conceptual and thematic categorisations

288. A set of indicators can be structured in two ways: according to the conceptual dimensions (this approach is referred to as the conceptual categorisation), or according to the themes indentified in this report (referred to as thematic categorisation). Both categorisations, and the advantages and disadvantages associated with them, are discussed below.

Conceptual categorisation

289. Table 7.1 shows how the indicator set would be structured when relying on the conceptual categorisation. In this case, the organising principle is provided by the conceptual distinction between the dimensions 'here and now', 'later' and 'elsewhere' which was discussed in Parts I and II of this report.

290. To make it easier to refer to the themes throughout the Report, the following codes are used in Table 7.1: HWB - Human well-being; EC – Economic capital; NC – Natural capital; HC – Human capital; SC – Social capital; TI – Transboundary impacts. "M" is used to denote monetary capital indicators as distinct from physical indicators of capital.

[28] These dimensions should not be mixed up with the three pillars of sustainable development: the economic, environmental and social pillars that are sometimes also called 'dimensions'. The 'here and now' dimension covers the different aspects of human well-being of the current generation, including the economic, environmental and social aspects. The dimension 'later' relates to how much economic and financial, natural, human and social capital the current generation leaves for the future generations so that they can pursue their well-being. The dimension 'elsewhere' is used to measure the impact that one country (region, etc.) has on other parts of the world, again including its economic, environmental and social aspects.

Table 7.1 Conceptual categorisation

Dimension	Sub-dimension	Theme	Aggregate indicator	Indicators showing distribution (inequality)
Human well-being ('Here and now')		HWB1. Subjective well-being		
		HWB2. Consumption and income		
		HWB3. Nutrition		
		HWB4. Health		
		HWB5. Labour		
		HWB6. Education		
		HWB7. Housing		
		HWB8. Leisure		
		HWB9. Physical safety		
		HWB10. Land and ecosystems		
		HWB11. Water		
		HWB12. Air quality		
		HWB13. Trust		
		HWB14. Institutions		
Capital ('Later')	Economic capital	EC1. Physical capital		
		EC2. Knowledge capital		
		EC3. Financial capital		
		EC-M. Economic capital		
	Natural capital	NC1. Energy resources		
		NC2. Non-energy resources		
		NC3. Land and ecosystems		
		NC4. Water		
		NC5. Air quality		
		NC6. Climate		
		NC-M. Natural capital		
	Human capital	HC1. Labour		
		HC2. Education		
		HC3. Health		
		HC-M Human capital		
	Social capital	SC1. Trust		
		SC2. Institutions		
		SC-M. Social capital		
Transboundary impacts ('Elsewhere')	Consumption and income	TI1. Consumption and income		
	Economic and financial capital	TI2. Physical capital		
		TI3. Knowledge capital		
		TI4. Financial capital		
	Natural capital	TI5. Energy resources		
		TI6. Non-energy resources		
		TI7. Land and ecosystems		
		TI8. Water		
		TI9. Climate		
	Human capital	TI10. Labour		
	Social capital	TI11. Institutions		

Note: The lightly shaded areas denote non-monetary capital indicators (physical indicators) and the dark shaded areas indicate monetary capital indicators.

291. Section 2.3.3 confronted the two different approaches on how best to conceptualise sustainable development: the integrated and future-oriented approach. Users could adopt the whole indicator set or just part of it depending on their preferred approach:

- *Integrated approach*. From this standpoint, sustainable development is considered to encompass the well-being of both current and future generations. All three dimensions, 'here and now', 'later' and 'elsewhere', are therefore relevant; this implies that users relying on the integrated view should consider the whole of Table 7.1. Users could also opt for excluding the indicators for monetary aggregates (the dark shaded areas), discussed in section 5.7.
- *Future-oriented approach*. In this approach, sustainable development is considered to focus on ensuring the well-being of future generations. Therefore, users relying on this approach will only be interested in the 'later' dimension of the dashboard, i.e. in measures of the amount of economic, natural, human and social capital that is left for the future generations. Two varieties of the capital approach can be distinguished:
    - The *hybrid capital approach,* which combines both monetary and physical indicators, with a tendency to focus on the latter indicators (lightly shaded areas).
    - The *monetary capital approach* where all capital stocks are monetised (dark shaded areas).

292. The last two columns of Table 71 will be 'populated' with a range of indicators proposed in Chapter 8. The fourth column will be used for aggregate (i.e. country-wide) indicators (totals, averages, mean values); while the fifth column will be used for indicators showing the distribution of each variable among different groups of population. The latter column is added to reflect the cross-cutting nature of inequality, which is relevant to most of the themes and indicators in a SDI set. Therefore, wherever possible, a breakdown of the indicators for different groups (e.g. gender, age group, ethnic background, etc.) should be included under the themes.

Thematic categorisation

293. The thematic categorisation organises the indicators according to the 20 themes defined in Part II of the Report. In other words, this presentation does not distinguish between the dimensions 'here and now', 'later' and 'elsewhere'. Table 7.2 shows the template proposed by the Task Force for a dashboard of indicators based on the thematic categorisation.[29]

Table 7.2 Thematic categorisation

Theme	**Aggregate indicator**	**Indicator showing distribution (inequality)**
TH1. Subjective well-being		
TH2. Consumption and income		
TH3. Nutrition		
TH4. Health		
TH5. Labour		
TH6. Education		
TH7. Housing		
TH8. Leisure		
TH9. Physical safety		
TH10. Land and ecosystems		
TH11. Water		

[29] The users may wish to combine related themes according to country specific needs. For example, the themes *energy* and *climate* are interconnected and could be merged into one theme "*climate and energy*". Similarly, the themes *education* and *knowledge capital* could be merged into one theme.

TH12. Air quality		
TH13. Climate		
TH14. Energy resources		
TH15. Non-energy resources		
TH16. Trust		
TH17. Institutions		
TH18. Physical capital		
TH19. Knowledge capital		
TH20. Financial capital		

Linking the conceptual and thematic categorisation

294. Both the conceptual and thematic categorisations are derived from the theoretical model and measurement approaches described in Parts I and II of the Report. They are simply different ways of presenting the same set of indicators. Table 7.3 shows the relationship between the two categorisations.

295. One of the main tasks included in the Terms of Reference of this Task Force was to link these two approaches. The framework proposed in table 7.3. can be used for analysing the existing SDI sets or as a basis for developing new ones. The existing SDIs can be compared to the framework to see whether there are important themes that they miss. The framework can also help to analyse how the indicators selected to support national sustainable development strategies relate to the conceptual dimensions of sustainable development identified in this report (human well-being, capital, international aspect).

296. In Table 7.3, the themes proposed in the Chapters IV-VI are listed in the first column, while the next three columns highlight their relationship with the three dimensions according to the Brundtland report. The table highlights the fact that some indicators belong to more than one dimension. For example, indicators on *education* and *health* are relevant for both the 'here and now' and the 'later' dimensions. Similarly, the indicators on labour are relevant to all three dimensions.

Advantages of the conceptual categorisation

297. *Trade-offs between 'here and now', 'elsewhere' and 'later'.* The main advantage of the conceptual categorisation is that it allows to identify the fundamental trade-offs between the well-being of current and future generations ('now' and 'later'), or between people living in one country and those living in others ('here' and 'elsewhere'). It is much more difficult to track down these trade-offs in the thematic categorisation.

298. *Close connection to economic modelling*. The classification into the three dimensions (human well-being, capital and the transboundary impacts) is also closely linked to the economic theory. As a consequence, the conceptual approach is more amenable to economic modelling.

299. *Close connection to satellite accounts*. Because of the link to economic concepts, the conceptual approach is also more consistent with measurement systems and satellite accounting such as the *System of National Accounts* and the *System of Environmental and Economic Accounting* (SEEA).

Advantages of the thematic categorisation

300. *Terminology of policy makers*. In the thematic approach, the classification may be more suited to the language used by policy makers and to the societal priorities that they consider important. This categorisation allows monitoring of individual policy areas.

301. *Indicators of policy drivers*. The thematic approach makes it easier to introduce indicators that give additional information on how to reinforce existing positive trends or to reverse negative ones. Such indicators are called "drivers" in this Report. For example, complementary to the capital stock indicators, sub-indicators on investments or efficiency (productivity) could be added, as they provide information on trends among some of the drivers of sustainable development. These can in turn be relevant to policy makers seeking to influence those drivers in order to promote sustainability.

Table 7.3 Linking the conceptual and thematic categorisation

Themes	**Dimensions**		
	Human well-being	**Capital**	**Transboundary impacts**
	('Here and now')	**('Later')**	**('Elsewhere')**
TH1. Subjective well-being	HWB1		
TH2. Consumption and income	HWB2		INT1
TH3. Nutrition	HWB3		
TH4. Health	HWB4	HC3	
TH5. Labour	HWB5	HC1	INT10
TH6. Education	HWB6	HC2	
TH7. Housing	HWB7		
TH8. Leisure	HWB8		
TH9. Physical safety	HWB9		
TH10. Land and ecosystems	HWB10	NC3	INT7
TH11. Water	HWB11	NC4	INT8
TH12. Air quality	HWB12	NC5	
TH13. Climate		NC6	INT9
TH14. Energy resources		NC1	INT5
TH15. Non-energy resources		NC2	INT6
TH16. Trust	HWB13	SC1	
TH17. Institutions	HWB14	SC2	INT11
TH18. Physical capital		EC1	INT2
TH19. Knowledge capital		EC2	INT3
TH20. Financial capital		FC1	INT4
Economic and financial capital - monetary		*FC-M*	
Natural capital - monetary		*NC-M*	
Human capital - monetary		*HC-M*	
Social capital - monetary		*SC-M*	

Note: The 4 monetary aggregates are shown in italics.

The use of one or both categorisations

302. Both the conceptual and thematic categorisations have advantages and disadvantages. To make use of the strong points of both categorisation methods, they could be used simultaneously based on the links presented in Table 7.3.

7.3. Indicator typology

303. The conceptual model presented in Part I was summarised by Figures 3.1 and 3.2, which show the complex relationship and causalities between the dimensions of 'here and now', 'later' and 'elsewhere'. The theoretical model also allows distinguishing between the various types of indicators that can be used. For example, indicators for the capital dimension can be further grouped into *stock* indicators to measure levels *of different types of capital* and *flow* indicators to monitor investments, depreciation or extraction that add or reduce the capital stock (see Figure 3.1). Other types of indicators can also be included, such as *ratio* indicators providing information about the productivity or intensity of use of certain capital stocks.

304. The following typology is used in the Report to distinguish between different types of indicators (the acronym after the titles will be used in the tables presented in chapter 8).

(a) *Core indicators*. These indicators represent the top tier of the framework. They are used in both the conceptual and the thematic categorization. Concerning the different dimensions of sustainable development, the core indicators are used for the assessment of

- *The different themes of human well-being (CORE-HW).*
- *Level of capital stock (CORE-C).*
- *Impacts of one country on other countries or regions (CORE-TI).*
- *Distribution of human well-being and capital as cross-cutting issue (DIST)*

(b) *Policy drivers.* These indicators provide information on how the core indicators are influenced. They are used mainly in the thematic categorisation.

- *Investment (INV).* These indicators are only used for themes related to capital.
- *Depreciation/Extraction (DEPR).* These indicators are only used for themes related to capital and show a reduction of a capital stock.
- *Productivity (PROD).* The efficiency of use of the capital input is expressed as a ratio of output per unit of input.
- *Intensity (INT).* This is the inverse of the productivity, and shows how much capital input is required per unit of output.
- *Other (OTH).* There are also indicators that are more difficult to classify. While it is possible to expand the typology further, this Task Force considered the above categories sufficient for the purposes of classifying the sustainable development indicators in this report.

CHAPTER 8. SUSTAINABLE DEVELOPMENT INDICATORS: THREE PROPOSED SETS

8.1. Introduction

305. In this chapter three sets of sustainable development indicators are proposed: a large set based on the conceptual categorisation (60 indicators), a large set based on the thematic categorisation (90 indicators), and a small set based on the thematic categorisation (24 indicators).

306. The Chapter is structured as follows. Section 8.2 explains the procedure followed to select indicators. Section 8.3 presents the two large sets of indicators, while section 8.4 presents the small set. Finally, Section 8.5 looks at the availability of the proposed indicators in international databases of the United Nations and Eurostat, and discusses the relationship with official statistics.

8.2. Selection procedure of the indicators

307. Chapter 7 argued that sets of SDIs can be organised in two ways: according to either the conceptual or the thematic categorisation. For each categorisation, Chapter 7 identified the relevant sustainable development themes. In this section, the selection procedure used by the Task Force to select the actual indicators for these three sets is explained in some detail. The selection procedure is represented graphically in Figure 8.1.

308. Three criteria are used in the selection process:

a) *Ideal indicators*. The conceptual approach used in this report is the most important criterion used by the Task Force for selecting indicators: this conceptual approach dictates which are the "ideal indicators" that would best fit what we want to measure (see Annex IV for a discussion of ideal indicators for each of the 20 themes).

b) *Commonalities.* A second criterion was to look at the prevalence of the various indicators in SDI sets that currently exist. Annex V presents a detailed analysis of the sustainable development indicator sets used by the United Nations, Eurostat and the World Bank, as well as by seven OECD countries. The indicator set proposed by the OECD in the context of its "Better Life Initiative" is not included in Annex V as these indicators are only limited to the 'here and now' dimensions.

c) *Data availability.* The third criterion is the availability of data in the international databases of the United Nations, the OECD and Eurostat.

309. As mentioned above, for the selection of indicators in the two large sets, the "ideal indicator" is the most important criterion. The prevalence of indicators in existing SDI sets ("commonalities") is also important, but less so than the conceptual criterion. This implies that if an indicator is common to many SDI sets but is not considered an "ideal" to measure any of the dimensions of the conceptual framework, then the indicator is not included in the set proposed by this Task Force. For example, indicators pertaining to transport (or to other economic sectors) are very common in SDI sets, but are not included here because 'transport' is not one of the themes of the conceptual framework presented in this Report. Alternatively, if an indicator is part of the ideal indicator set, but is rarely used in the current SDI sets (e.g. hours worked), then the indicator is still included in the large sets proposed here. Data availability is the least important of the three criteria. As a result, if an indicator is not available in international databases, a "place holder" is included here.

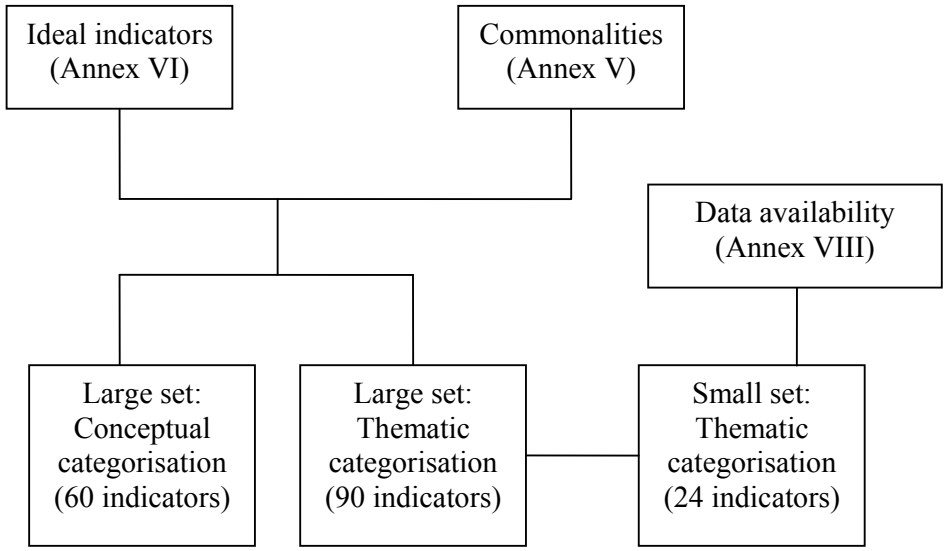

Figure 8.1 Selection procedures for the large and small sets

310. For the small set, the selection procedure is different. The small set is a subset of the large set (thematic categorisation) that includes only indicators for which data are actually available in the various databases reviewed here. The total of 24 indicators included in the small set can be divided into three groups:

(a) 20 national aggregate indicators, i.e. one indicator is chosen for each of the 20 themes. In 15 cases, the most common sub-themes or indicators in SDI sets are used as a selection criterion. There are four exceptions where conceptual considerations prevail (see annex VI for detail).

(b) Two indicators for the Transboundary impacts. The two most common indicators pertaining to the transboundary impacts (ODA, imports from developing countries) are selected here.

(c) Two indicators showing distribution/inequality. The two most common indicators for the distribution (income inequality and gender pay gap) are selected.

8.3. Two large sets of indicators

311. Tables 8.1 and 8.2 present the two large sets of indicators, according to the conceptual and the thematic categorisation respectively. Both tables have a column to represent the national totals/averages, and a column for indicators showing the distribution of the variable considered among the population.

312. Table 8.1 has 60 indicators overall, of which 12 pertain to distributions. Note that some indicators are included in Table 8.1 twice, as the themes 'education', 'labour', 'health', 'trust' and 'institutions' are relevant for both the 'here and now' and the 'later' dimensions. As a result, the indicators pertaining to them also appear twice in the table. In total, there are therefore 48 unique indicators. Table 8.2 includes 90 indicators, of which seven are indicators about inequality. The thematic categorisation has more indicators than the conceptual categorisation as it also includes indicators for policy drivers (see section 7.4). For example, while the conceptual categorisation has indicators only about levels of different types of capital, the thematic categorisation includes indicators about investments or productivity.

Table 8.1. Sustainable development indicators: large set – conceptual categorisation (60 indicators)

Dimension	Sub-dimension	Theme	Aggregate indicator	Indicators showing distribution (inequality)
Human well-being ('Here and now')		HWB1. Subjective well-being	Life satisfaction	
		HWB2. Consumption and income	Final consumption expenditure	Income inequality, Gender Pay gap
		HWB3. Nutrition	Obesity prevalence	
		HWB4. Health	Life expectancy at birth	Distribution-health
		HWB5. Labour	Employment rate	Female employment rate, Youth employment rate
		HWB6. Education	Educational attainment	Distribution-education
		HWB7. Housing	Living without housing deprivation	
		HWB8. Leisure	Leisure time	
		HWB9. Physical safety	Death by assault/homicide rate	
		HWB10. Land and ecosystems	Bird index	
		HWB11. Water	Water quality index	
		HWB12. Air quality	Urban exposure to particulate matter	
		HWB13. Trust	Generalised trust	
			Bridging social capital	
		HWB14. Institutions	Voter turnout	Percentage of women in parliament
Capital ('Later')	Economic capital	EC1. Physical capital	Physical capital stock	
		EC2. Knowledge capital	Knowledge capital stock	
		EC3. Financial capital	Assets minus liabilities	
		EC-M. Economic capital	*Economic capital*	
	Natural capital	NC1. Energy resources	Energy resources	
		NC2. Non-energy resources	Non-energy resources	
		NC3. Land and ecosystems	Land assets	
			Bird index	
		NC4. Water	Water quality index	
		NC5. Air quality	Urban exposure to particulate matter	
		NC6. Climate	Global CO_2 concentration	
			State of the ozone layer	
		NC-M. Natural capital	*Natural capital*	
	Human capital	HC1. Labour	Employment rate	Female employment rate, Youth employment rate
		HC2. Education	Educational attainment	Distribution-education
		HC3. Health	Life expectancy at birth	Distribution-health
		HC-M Human capital	*Human capital*	
	Social capital	SC1. Trust	Generalised trust	
			Bridging social capital	
		SC2. Institutions	Voter turnout	Percentage of women in parliament
		SC-M. Social capital	*Social capital*	
Transboundary impacts ('Elsewhere')	Consumption and income	TI1. Consumption and income	Official Development Assistance (ODA)	
			Imports	
	Economic and financial capital	TI2. Physical capital	Export of physical capital	
		TI3. Knowledge capital	Export of knowledge capital	
		TI4. Financial capital	Foreign Direct Investment (FDI)	
	Natural capital	TI5. Energy resources	Import of energy resources	
		TI6. Non-energy resources	Import of non-energy resources	
		TI7. Land and ecosystems	Land footprint (foreign part)	
		TI8. Water	Water footprint (foreign part)	
		TI9. Climate	Carbon footprint (foreign part)	
	Human capital	TI10. Labour	Migration of human capital	
	Social capital	TI11. Institutions	Contribution to international institutions	

Table 8.2. Sustainable development indicators: large set- thematic categorisation (90 indicators)

Theme	Indicator type	Aggregate indicator	Indicator type	Indicator showing distribution (inequality)
TH1. Subjective well-being	CORE-HW	Life satisfaction		
TH2. Consumption and income	CORE-HW	Final consumption expenditure	DIST	Income inequality
	OTHER	GDP per capita	DIST	Gender pay gap
	OTHER	Labour productivity		
	CORE-TI	Official Development Assistance (ODA)		
	CORE-TI	Imports		
TH3. Nutrition	CORE-HW	Obesity prevalence		
TH4. Health	CORE-HW/C	Life expectancy at birth	DIST	Distribution-health
	CORE-ADD	Healthy life expectancy at birth		
	CORE-ADD	Suicide death rate		
	INV	Health expenditures		
	DEPR	Smoking prevalence		
TH5. Labour	CORE-HW/C	Employment rate	DIST	Female employment rate
	CORE-ADD	Hours worked	DIST	Youth employment rate
	DEPR	Average exit age from labour market		
	CORE-TI	Migration of human capital		
TH6. Education	CORE-HW/C	Educational attainment	DIST	Distribution-education
	INV	Expenditures on education		
	CORE-ADD	Competencies		
	DEPR	Early school leavers		
	INV	Lifelong learning		
TH7. Housing	CORE-HW	Housing stock		
	INV	Investment in housing		
	CORE-ADD	Living without housing deprivation		
	OTHER	Affordability		
TH8. Leisure	CORE-HW	Leisure time		
TH9. Physical safety	CORE-HW	Death by assault/homicide rate		
	INV	Expenditures on safety		
TH10. Land and ecosystems	CORE-C	Land assets		
	INV	Protected areas		
	DEPR	Nutrient balance		
	DEPR	Emissions to soil		
	CORE-HW/C	Bird index		
	DEPR	Threatened species		
	CORE-TI	Land footprint (foreign part)		
TH11. Water	CORE-C	Water resources		
	DEPR	Water abstractions		
	CORE-C	Water quality index		
	DEPR	Emissions to water		
	CORE-TI	Water Footprint (foreign part)		
TH12. Air quality	CORE-HW/C	Urban exposure to particulate matter		
	DEPR	Emissions of particulate matter		
	CORE-ADD	Urban exposure to ozone		
	DEPR	Emissions of tropospheric ozone		
	DEPR	Emission of acidifying substances		
TH13. Climate	CORE-C	Global CO_2 concentration		
	DEPR	Historic CO_2 emissions		
	DEPR	GHG-Emissions		

	INT	GHG-Emissions Intensity		
	CORE-TI	Carbon footprint (foreign part)		
	CORE-C	State of the ozone layer		
	DEPR	CFC emissions		
TH14. Energy resources	CORE-C	Energy resources		
	DEPR	Consumption		
	INT	Energy intensity		
	OTHER	Renewable energy		
	CORE-TI	Import of energy resources		
	OTHER	Energy dependence		
TH15. Non-energy resources	CORE-C	Non-energy resources		
	DEPR	Domestic material consumption		
	PROD	Resource productivity		
	DEPR	Generation of waste		
	INV	Recycling rate		
	CORE-TI	Import of non-energy resources		
TH16. Trust	CORE-HW/C	Generalised trust		
	CORE-HW/C	Bridging social capital		
	INV	Contact with family and friends		
	INV	Participation in voluntary work		
TH17. Institutions	CORE-HW/C	Voter turnout	DIST	Percentage of women in parliament
	CORE-ADD	Trust in institutions		
	CORE-TI	Contribution to international institutions		
TH18. Physical capital	CORE-C	Capital stock		
	INV	Gross capital formation		
	CORE-TI	Export of physical capital		
TH19. Knowledge capital	CORE-C	Capital stock		
	INV	R&D expenditures		
	CORE-ADD	Knowledge spillovers		
	CORE-TI	Export of knowledge capital		
TH20. Financial capital	CORE-C	Assets minus liabilities		
	OTHER	Government debt		
	OTHER	Current deficit/surplus		
	CORE-ADD	Pension reserves		
	CORE-TI	Foreign direct investment (FDI)		

313. The indicators in the large set based on the conceptual categorisation (60) are all included in the large set based on the thematic categorisation (90). This overlap facilitates the harmonisation of the different approaches used to build up SDI sets in different countries, regardless of whether they are more in line with a conceptual and thematic approach.

8.4. A small set of indicators

314. The two large sets of sustainable development indicators include 60 indicators for the conceptual categorisation, and 90 indicators for the thematic one. Compared to some of the existing SDI sets, these are fairly modest numbers of indicators. Nevertheless, it is difficult to communicate key messages on the sustainability of a development path through such a relatively large set. The Task Force was therefore also mandated to propose a "small" set of SDIs.

315. CES (Commission of European Statisticians) member countries were consulted on what they would regard as an appropriate number of indicators to be included in a small set, and most of them indicated a range of 5-15 indicators as optimal[30]. However, the analysis of various SDI sets undertaken by the Task Force shows that the number of headline indicators generally included in SDI sets is usually higher (at between 15-20 indicators).

316. Table 8.3 shows the small set of indicators. The set is a subset of the large set of 90 indicators due to data availability (the indicators included in the large set of 90 were first selected based on ideal indicators and commonalities, as explained in section 8.2 and in Annex VI). Box 8.1 summarises a number of alternative strategies that could be followed to create a small set.

Table 8.3. Sustainable development indicators: small set – thematic categorisation (24 indicators)

Theme	Indicator
Subjective well-being	Life satisfaction
Consumption and income	Final consumption expenditure
	Official Development Assistance (ODA)
	Imports from developing countries
	Income inequality
	Gender pay gap
Nutrition	Obesity prevalence
Health	Life expectancy at birth
Labour	Employment rate
Education	Educational attainment
Housing	Living without housing deprivation
Leisure	Leisure time
Physical safety	Death by assault/homicide rate
Land and ecosystems	Bird index
Water	Water abstractions
Air quality	Urban exposure to particulate matter
Climate	GHG-Emissions
Energy resources	Consumption
Non-energy resources	Domestic Material Consumption
Trust	Generalised trust
Institutions	Voter turnout
Physical capital	Gross capital formation
Knowledge capital	R&D expenditures
Financial capital	Government debt

Box 8.1. Various ways of aggregation/indicator selection

Composite indicators/Monetisation. One option to reduce the number of indicators is to aggregate some of them either through monetisation or by creating a composite indicator. An example of such an indicator is the measure of total wealth used by the World Bank. However, as discussed in Chapters 2 and 5, both monetisation and composite indicators rely on assumptions that are often debated, and have their own limitations.

Correlation analysis. Some indicators may be heavily correlated with others included in the same set, which would therefore make one or the other redundant. The extent of correlation may however vary across countries. This method can only be applied to countries which have time-series of a sufficient length.

Visualisation. Instead of reducing the number of indicators, it is also possible to use visualisation techniques to draw attention to the main messages provided by the data. Annex IX provides an inventory of visualisation techniques that have been developed by various institutions to facilitate the

[30] In the consultation of the draft report with member countries of the Conference of European Statisticians in March/April 2011

communication of their SDI sets. Annex X also discusses and shows evidence for a number of specific examples.

Stakeholder's consultations. Feedback from stakeholders can be used to reduce the number of indicators. This type of consultation is most relevant at the national level and also helps to obtain support for the indicator set. A good example is the process followed in Switzerland (Boesch et al., 2009).

Other criteria. Other criteria may be adopted to select indicators. For example, the OECD publication "How's life?" uses two types of criteria: relevance with regard to the target concept and quality of supporting data. [31]

8.5. Data availability and the relationship with official statistics

317. The mandate of this Task Force asked for an analysis of the proposed set of indicators from the point of view of data availability within official statistics. Annex VIII provides the results of the analysis for 46 countries.

318. The availability of data needed to compile the selected indicators for the EU and OECD member countries and the six BRIICS countries (Brazil, Russia, India, Indonesia, China, and South Africa) was assessed by looking at the databases of the United Nations and Eurostat. The presence of data for the period 2000-2010 is analysed. The purpose of this analysis was to obtain a rough estimate of how many of the proposed indicators are available within these international databases, which are typically based on data provided by official sources (i.e. NSOs and administrative sources of various countries). While more information on data availability for the selected indicators can be obtained by looking at the databases of different NSOs, such a comprehensive analysis was deemed to fall outside the reach of this Task Force. Further details on data availability are provided in Annex VIII.

319. Table 8.4 summarises to what extent the suggested indicators are available in the databases of the two international organisations reviewed here. The indicators are divided into two categories: data that are currently available in the databases of the United Nations and Eurostat; and data that are available in other international databases[32]. Besides, a category of placeholders is distinguished, which consists of indicators which are needed on conceptual grounds but which are not yet available in international datasets.

320. Table 8.4 shows the data availability for the different indicator sets. Especially for datasets which are based on the thematic categorisation, data are widely available. For the small set of indicators the bulk of indicators, 92%, can be derived from the UN/Eurostat databases. For the large set of indicators, based on the conceptual categorisation, this percentage is much lower (55%). This is due to the limited coverage of data in the dimensions 'elsewhere' (50%) and 'later' (42%).

[31] These two categories are also split into sub-categories. Relevance with regard to the target concept is split into: face-validity; unambiguous interpretation; amenable to policy changes; possibility to disaggregate by groups. Quality of supporting data is split into: well-established sources; comparable definitions; maximum country coverage; recurrent data collection.

[32] Indicators such as 'life satisfaction', 'generalised trust', contact with family and friends' and 'voluntary work' are not currently available in the two international databases but can be found in the European Social Survey (ESS) which is a respected survey of social attitudes in Europe. Two climate change related indicators (CO_2 concentration and state of the ozone layer) are based on climate science, and computed by the National Oceanic and Atmospheric Administration (NOAA) and the NASA respectively). The OECD and World Bank databases were also checked as secondary source.

Table 8.4. Data availability of the three indicator sets

	Large set					**Small set**
	Conceptual categorisation				**Thematic categorisation**	**Thematic categorisation**
	Here and now	Later	Elsewhere	Total		
Available:	*82%*	*65%*	*50%*	*68%*	*76%*	*100%*
- databases UN/Eurostat	*73%*	*42%*	*50%*	*55%*	*69%*	*92%*
- Other	*9%*	*23%*	*0%*	*13%*	*7%*	*8%*
Place-holders:	*18%*	*35%*	*50%*	*32%*	*24%*	*0%*
Official sources/SEEA/SNA	*73%*	*58%*	*50%*	*62%*	*80%*	*92%*

321. The two large indicator sets also have a number of "place-holders". These indicators are not available in the databases analysed here and would need further development. However, what is not measurable or available today might be measurable in the future. The 'place-holders' included in Table 8.4 point to the need for the statistical community to develop better metrics for these themes in the future. Several of these place-holders in Table 8.4 refer to indicators that are expected to be developed as a result of the application of the SNA2008 and SEEA2012 standards. For example, data on energy resources and non-energy resources, which are not yet available in international databases, have statistical guidelines for their measurement laid out in the SEEA2012 and are expected to become increasingly available in the future. The 'place-holders' for variables are expected to become available following the implementation of SNA2008 measures of the stock of knowledge capital (based on the capitalisation of expenditures in Research and Development) and land assets.

322. The other place holders relate to footprint indicators (land, water, carbon footprint). There are also quite a few place-holders for indicators pertaining to distributional issues and inequality (in health, housing, education).

Official statistics

323. The availability of sustainable development indicators in these international databases is important when assessed from the perspective of quality standards, as all of these international organisations (and most of the national providers of these data) apply 'standards' to assess the quality of the information that they disseminate. The data that are available from outside these sources are not necessarily of lower quality. Many providers of statistical data that are usually labelled as 'non-official' pay significant attention to quality and implement strict procedures to verify the data. However, their quality criteria may be different from those applied in official statistics. Furthermore, the procedures of collecting, producing and disseminating data may also differ from official statistics. For example, there may be no obligation to protect data confidentiality, some stakeholders may have privileged access to the data, the independence and impartiality may not be guaranteed, because of the importance of official statistics, Annex VI provides an extensive discussion of the principles that regulate their collection and dissemination.

324. The analysis based on the United Nations and Eurostat databases (international organisations whose work is within the realm of official statistics) shows that 55-92% of the indicators are available from international statistical sources. When adding the place-holders derived from the two international statistical standards, the SNA and SEEA, the indicators that are expected to become available from official statistical sources in the near future amount to 62-92%.

325. The high availability of the suggested sustainable development indicators in data sources reviewed here suggests that official statistics are already on the right path to measuring sustainable development.

PART IV. THE WAY FORWARD

326. This final part of the Report outlines potential areas of future work. Section 9.1 focuses on measurement issues and points out some desiderata in terms of the refining, extending and implementation of the measurement system. Building a measurement system is one thing, but due attention should be paid to a proper communication and visualisation of the data. Section 9.2 focuses on these issues. Finally, section 9.3 investigates to what extent the indicators presented in this Report fit global policy initiatives such as the Millennium Development Goals and the Sustainable Development Goals which are under construction.

Chapter 9. Future Work: Measurement, Communication and the Post Rio+20 Agenda

CHAPTER 9. FUTURE WORK: MEASUREMENT, COMMUNICATION AND THE POST RIO+20 AGENDA

9.1. Measurement issues

327. This Task Force has presented a conceptual framework on which three sets of potential indicators are based. The conceptual dashboards enable the user to distinguish developments in human well-being 'here and now', 'later' and 'elsewhere'. The thematic dashboard makes it easy for users to track important changes in sustainable development by policy area. A lot of effort was put into checking the data availability, especially within the realm of official statistics.

328. Even though this Task Force has done a lot of work on the issues which were mentioned in its Terms of Reference, there are still areas where further work is needed:

(a) *Transboundary impacts.* More work is needed in the field of measuring the international distributional aspects of societal development. Apart from the environmental aspects and the impact of affluent countries on developing countries, the social and economic inter-relationships between countries should be part of any measurement system on sustainable development. The Report proposes a framework to quantify these international aspects, though much more empirical work is needed in order to develop better measures for the transboundary impacts.

(b) *Further work on specific topics.* More work needs to be done to arrive at better capital indicators:

- Human capital. More indicators for health need to be developed that can be used for international comparisons.
- Social capital. Only "trust" measures are widely used as indicators for social capital. Other important aspects of social capital such as "norms and values" and "bridging social capital" (i.e. charting the ways in which different groups of society are interconnected) still lack proper measures.
- Natural capital. The measurement of biodiversity and ecosystems needs more attention. Methods for measurement are currently being developed in the SEEA volume on ecosystems. Future research should focus on at least these three areas:
  - Linking ecosystem services systematically to human well-being;
  - Focussing valuation on the basis of measurements of degradation;[33]
  - Experimenting with Green National Accounting techniques.[34]
- Distribution. Distributional aspects (inequality) are an important component of sustainable development. Information on income inequalities exists, but internationally comparable statistics on inequality in the area of health, education and other themes are very rare.
- Time use. More use can be made of information on time-use in order to measure non-market activities which are relevant to sustainable development (especially in the field of human and social capital).

[33] See Weber, Jean-Louis. 2011. An experimental framework for ecosystem capital accounting in Europe, EEA Technical report No 13/2011, European Environmental Agency. http://unstats.un.org/unsd/envaccounting/seearev/meetingMay2011/lod.htm

[34] See Oviedo, Jose L., Pablo Campos and Alejandro Caparrós. 2010. Simulated Exchange Value Method: Applying Green National Accounting to Forest Public Recreation. Consejo superior de investigaciones cientficas (CSIC) Institute of Public Goods and Policies (IP). http://www.ipp.csic.es/RePec/ipp/wpaper/16_Oviedo_Campos_Caparros.pdf

(c) *Linking subjective and objective indicators.* More work needs to be done to link subjective (perception) indicators on human well-being to actual living conditions (i.e. objective measure of health linked to the ways in which people perceive their health, etc.). Ideally, this work could be undertaken using comprehensive surveys in which information is gathered at a micro level for each of the different sustainable development themes distinguished in this report, and by presenting objective as well as subjective measures. The work on measuring current well-being could benefit from a more direct confrontation of micro and macro measures at the level of individuals. Comprehensive surveys on the well-being of individuals at micro level are still lacking for a large number of countries.

(d) *Time series*. As sustainability is a concept which deals with inter-generational issues, long time series can be helpful to identify how present-day sustainability problems have come into existence.

(e) *Measuring sustainable development at different scale-levels.* Attempts should be made to measure sustainable development at other scale-levels than that of countries. For example, work could be undertaken to explore the possibility to apply the indicator set at a company level, by harmonising the work of this Task Force with work of other initiatives such as the Global Reporting Initiative (GRI) undertaken by the business community. Besides, there are ample opportunities to provide the user with interesting breakdowns revealing the underlying distribution of the data. A sub-categorisation by industry or by type of household in satellite accounts can be particularly useful in order to study the ways in which economic, ecological and social developments are interrelated. Finally, distinctions can be made between rural and urban areas (see for example the Millennium Development Goals, mentioned in section 9.3).

329. Apart from possible refinements and extensions of the proposed dataset, the work of this Task Force may also serve as an input to the ongoing process of harmonising the measurement of human well-being and sustainable development:

(f) Developing harmonised indicator sets for measuring sustainable development. There is a great need for national statistical agencies and international organisations to harmonise their SDI sets to be better suited for international comparison. This Report contributes to the harmonisation of the work on measuring sustainable development, by presenting a conceptual framework that links the various measurement approaches that currently exist. By doing so, the similarities between the approaches become more visible than the differences. The conceptual foundation and the potential indicators suggested in this Report may serve as a good starting point for further harmonisation of the measurement systems and developing a set of indicators that could be used for comparison across countries.

9.2. Communication and visualisation

330. A proper implementation of a measurement system for sustainable development crucially depends on how the data are communicated. Even though issues of communication and visualisation are not part of the terms of reference of this Task Force, they deserve attention.

331. It is a true challenge to communicate the wealth of data on human well-being and sustainable development properly. The Annexes IX (Interpretation and visualisation of SDI sets in the context of official statistics) and X (Examples of indicator sets) discuss the communication and visualisation techniques that are used by various institutes in more detail.

332. Table 9.1 describes the principles formulated within the realm of official statistics on the usefulness of statistical information and sums up the key dimensions which are relevant for the interpretation of statistics.

333. *Table 9.1. Key dimensions of data quality*

Dimension	**Description**
Relevance	The degree to which the statistical product meets user needs in coverage, content and detail.
Coherence/ Consistency	The degree to which statistical information can be successfully brought together with other statistical information within a broad analytical framework and over time.
Interpretability	The availability of supplementary information and metadata necessary to interpret and use the statistics effectively.
Accuracy	The degree to which the information correctly describes the phenomena it was designed to measure.
Accessibility	The ease with which users are able to access and understand the statistical data and its supporting information.
Timeliness	The degree, to which the data produced are up to date, published frequently and delivered to schedule.

334. This overview of key dimensions shows the importance of working with a conceptual framework. In terms of coherence and consistency, a conceptual framework functions as an organising principle. As indicators are selected and presented according to a conceptual framework, users do not have to wade through an overwhelming amount of separate indicators. The conceptual framework does not only guide the statistician in the selection of indicators –and identifying which indicators are missing- but it may also serve as a basis for proper visualisations (see Annex X for some examples).

335. Many countries try to assist their users to understand the meaning of the information and for sustainable development a similar approach has generally been taken. At the core, there is a need to have a frame of reference against which the indicators can be measured.

336. Table 9.2**.** provides a summary of the frame of reference that is used by a selection of 27 countries. The table shows that most countries use stated policy targets as the frame of reference. While other countries which may not have specific policies or strategies for sustainable development, tend to identify desired trends from their conceptual framework. Comparison with other countries is another point of reference which is regularly employed, usually comparing European or OECD countries.

337. A report may be narrative, describing the statistics, identifying trends but not making any judgements about interpretation, leaving this completely to the reader. Another option is that the report can be more analytical, making informed judgements or interpreting the statistics to assist the reader. It can be a policy document which uses the statistics to support policy analysis or recommendations. In any case, it is useful to discuss and decide from the outset what the purpose and the type of report or product that will be produced.

338. One critical aspect of accessibility is to ensure that sustainable development indicators are compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information. This refers back to Principle 1 of the UN Fundamental Principles of Official Statistics (see Annex IX). Commonly referred to as 'equal access', the release process needs to manage this aspect of accessibility.

Table 9.2. Interpretation Methods for Selected Countries

	Interpretation		
Country	**Policy Target**	**Desired Trend**	**Country comparison**
Australia		☑	☑
Austria	☑		☑
Belguim	☑	☑	
Brazil	Reported no experience yet		
Bulgaria	☑		☑
Canada		☑	
Estonia			☑
European Commission	☑	☑	☑
Finland	☑		
France	☑		☑
Germany	☑	☑	
Hungary	☑		☑
Latvia	☑		☑
Lithuania	☑		☑
Luxemburg			
Republic of Macedonia			☑
The Netherlands		☑	☑
New Zealand		☑	
Norway	☑		
Poland	Reported no experience yet		
Portugal	☑		☑
Romania			
Slovakia	☑		☑
Spain			☑
Sweden		☑	
Switzerland		☑	☑
United Kingdom		☑	☑

Note: Australia measures "progress" rather than sustainable development but is included in this analysis.

339. Often the difference with sustainable development indicators and other official statistics is that the indicators may have already been published or released in their own right, however the indicators are being analysed in a different context and so the results may be perceived and reported differently. Maintaining the integrity of the report is important to ensure that results do not and are not perceived to have bias.

340. The conceptual framework and the selection criteria can play an essential role in terms of impartiality. Using internationally-accepted methodologies, standards and selection criteria limits the opportunities for agencies to unduly influence the indicator selection and their interpretation. Using a statistical framework rather than a policy-based framework can also help manage perceptions if the government of the day and therefore policy initiatives change.

341. Understanding the preferences of the intended audience for various statistical products and channels is also important for this principle. Statistical products can represent the 'what' whereas channels can represent 'how' information is communicated.

342. The effective use of technology is a key enabler in accessibility, but its use must be appropriate for the audience. If a web-based report which users can not access without high-speed broadband is produced, it could diminish the reach and usefulness of the statistics in some

countries. But in other countries, this form of dissemination can be expected as the norm. The sharing of best practice is always a good starting place but remembering to adapt for the circumstances within a country is important for success.

343. There are several ways to communicate sustainable development indicators, from on-line dashboards to paper-based publications. The decision about what products to produce requires an understanding of the audiences and their needs, the channels available and their cost, and the framework and size of the indicator set. There are several good examples from different countries as to how the information can be communicated.

344. Visualisation encompasses new and creative ways to attract and assist users in their understanding of statistical information. It is an important and growing area that supports the accessibility of sustainable development indicators.

345. The use of visualisation techniques can be a powerful way to engage users about sustainable development indicators and statistics in general. It also allows the linking of information via web-pages and websites.

346. Many users now expect to have access to the data used in the compilation of the indicators, so it is useful to think of these data as a statistical product in its own right and to consider the types of audiences and what their needs might be. With a large set of indicators this can mean a considerable amount of information to manage and communicate. It also requires liaising with the original producers of the information, whether internal or external to the organisation about their expectations for making available their information.

347. Many sustainable development publications contain a large number of indicators that need to be organised, analysed and written about. Many countries use a range of ways to visualise the results, which range from 'traffic lights' to 'weather symbols' to 'ticks and crosses'. Whatever the symbol, its purpose and description should be clear as to what it means.

348. Table 9.3 identifies, for a range of countries, the key techniques in which visualisation occurs. Graphs, charts and maps are among the more traditional techniques employed by countries. While colour schemes, symbols and techniques specifying the expected direction for the trends are among the more creative ways in which to visualise data.

349. Web tools represent both the latest thinking on visualisation techniques but also a significant investment in research and resources. In Annex X a number of examples are provided.

350. In terms of timeliness, the sooner the data can be compiled and made available the more useful it is for decision-making. While many countries look to provide regular updates, whether they are annual, two-yearly or five-yearly, it is important that the publishing dates are disseminated publically well in advance, in order to safeguard the integrity of the report.

351. The work on communicating and visualising SDI sets will be greatly enhanced by the Switzerland-led "Expert Group on Indicator-based Assessment", which presently works on the report**:** "Getting messages across using indicators. A handbook based on experiences from assessing sustainable development indicators"**.**

352. Finally, the communication of SDI's can be enhanced by increasing stake-holder participation in the dissemination of the results.

Table 9.3. Visualisation Techniques in Sustainable Development Reporting

Country	Graphs / Charts	Maps	Web Tools	Colours	Symbols	Direction
Australia	☑			☑	☑	
Austria	☑	☑				
Belguim	☑				↗➔↘	
Brazil	Reported no experience yet					
Bulgaria	No report found					
Canada	☑	☑	☑			
Estonia	☑		☑			
European Commission	☑				☼💧	
Finland	☑			☑	👍	
France	☑			☑	☺😐☹	☑
Germany	☑				☼💧	
Hungary	No report found					
Latvia	No report found					
Lithuania	☑	☑				
Luxemburg	☑					
Republic of Macedonia						
The Netherlands	☑	☑	☑			
New Zealand	☑			☑	☑	☑
Norway	No report found					
Poland	Reported no experience yet					
Portugal	No report found					
Romania			☑			
Slovakia	No report found					
Spain	No report found					
Sweden	☑				☺😐☹	☑
Switzerland	☑		☑	☑	☑	☑
United Kingdom	☑			☑	☑	☑

Legend for Symbols	
☼💧	Weather symbol
☑	Ticks and crosses
☺😐☹	Faces
👍	Hands
↗➔↘	Arrows

9.3. The post Rio+20 Agenda

353. In order to enhance the usefulness of the indicator sets proposed by this Task Force, a link to policy targets should be made where possible. Especially possible links between the Work of this Task Force and the recommendations of the Rio+20 Conference on sustainable development should be explored.

354. The final document of the *Rio+20 United Nations Conference on Sustainable Development* outlines an agenda for further activities.[35] Two possible directions are relevant from the point of view of this Task Force. First of all, paragraph 38 of the outcome of the conference indicates that "We recognize the need for broader progress to complement gross domestic product in order to better inform policy decisions, and in this regard we request the United Nations Statistical Commission, in consultation with relevant United Nations system entities and other relevant organizations, to launch a programme of work in this area building on existing initiatives".

355. Secondly, the outcomes of the Rio+20 Conference points to the need of policy action and formulating policy goals. Section 104 of the outcomes of this Conference states that "we recognize

[35] Rio+20, United Nations Conference on Sustainable Development, Agenda item 10. Outcome of Conference (19 June 2012).

that goals, targets and indicators, including where appropriate gender-sensitive indicators, are valuable in measuring and accelerating progress". The document proposes that the UN community formulates Sustainable Development Goals (SDG) which will replace or augment the Millennium Development Goals (MDG).

356. For the statistical world section 38 is of special relevance, especially because it stresses the importance of building on existing initiatives. The work of this Task Force may play an important role in the formulation of indicator sets in the Post Rio context. However, also the SDGs can be relevant to statisticians. Traditionally, measurement initiatives and work on policy, including the formulation of policy goals, are seen as rather different matters. This Task Force, however, argues (especially in section 2.3.1) that the so-called conceptual and policy-oriented approaches can be narrowly intertwined, and that it is fruitful for measurement and policy initiatives to be in close contact with one another. The measurement system and indicators which have been been proposed in the Chapter seven and eight are both conceptually sound, but simultaneously provide policy makers with the indicators they are used to having.

357. Before exploring the possibilities to link the work of this Task Force to the initiatives mentioned above, we should check to what extent data are available at a global level. The research on data availability and commonalities reported in Chapters seven and eight of this Report is biased towards the OECD and EU27 countries. However, in order to be able to link the work of this Task Force to the suggestions made within the Rio+20 context, additional work on the data availability is necessary.

358. Table 9.4 provides information about the global availability of data for the small set of indicators that was presented in Chapter eight.

359. The first two columns of this global set are identical to the small set of indicators that was presented in chapter eight (Table 8.3). For 14 out of the 24 indicators, the same indicators can be used for a world-wide small set of indicators. One indicator, the imports from developing countries, was dropped as this indicator is only relevant for the high-income countries.

360. For the following themes, alternative indicators were selected for the global dataset:

- Consumption and income, Official Development Assistance: in this global set the data refer to development aid *received* by countries;
- Consumption and income, Income inequality: the indicator most widely available is the 'share of the poorest quintile in national consumption'.
- Nutrition: Obviously obesity is mainly a problem in the high-income countries. In a global dataset, malnutrition prevalence is more relevant.
- Housing: One of the few proper indicators on housing quality available for a large number of countries is the share of urban population living in slums (derived from the Millennium Development Goals Indicators database).
- Climate: Even though Green House Gas emissions are only available for a limited number of countries, the emissions of CO_2 (the main greenhouse gas) can be found for a wide range of countries.
- Trust: Trust measures are hard to find, but the World Bank provides an interesting series of indicators on trust- and institutional related phenomena. The CPIA public sector management indicator is used as proxy.

361. *Table 9.4. Small Set of Indicators-Global Coverage*

Theme	**Indicator (Chapter 8)**	**Alternative indicator worldwide**	**Worldwide Availability (no of countries)**	**Source**
Subjective well-being	Life satisfaction		135	World Happiness Database
Consumption and income	Final consumption expenditure		210	United Nations
	Official Development Assistance (ODA) paid	Official Development Assistance (ODA) received	143	World Bank
	Imports from developing countries	*Not relevant*	-	-
	Income inequality	Share of poorest quintile in national consumption	134	United Nations (MDG)
	Gender pay gap		68	United Nations
Nutrition	Obesity prevalence	Malnutrition prevalence	160	United Nations
Health	Life expectancy at birth		185	United Nations
Labour	Employment rate		145	United Nations
Education	Educational attainment		184	United Nations
Housing	Living without housing deprivation	Urban population in slums	91	United Nations (MDG)
Leisure	Leisure time		20	MTUS
Physical safety	Death by assault/homicide rate		186	United Nations
Land and ecosystems	Bird index	Bird species threatened	214	World Bank (WDI)
Water	Water abstractions		93	United Nations
Air quality	Urban exposure to particulate matter		173	United Nations
Climate	GHG-Emissions	CO2-emission	229	World Bank
Energy resources	Consumption		187	United Nations
	Energy dependence			
Non-energy resources	Domestic Material Consumption		200	SERI
Trust	Generalised trust	CPIA public sector management	82	World Bank (WDI)
Institutions	Voter turnout		194	IDEA
Physical capital	Gross capital formation		156	United Nations
Knowledge capital	R&D expenditures		116	United Nations
Financial capital	Government debt		84	World Bank (WDI)

IDEA: International Institute for Democracy and Electoral Assistance
SERI: Sustainable Europe Research Institute
MDG: Millennium Development Goals
MTUS: Multinational Time Use Survey Database
WDI: World Development Indicators

362. This overview of indicators shows that it is possible to build the small set of indicators that was presented in Chapter 8 on a global scale. To see if these indicators are relevant to the challenges that especially the least developed countries are facing, this small set is confronted with the indicators as put forward in the Millennium Development Goals Programme.

363. The MDG indicators focus on highly relevant areas for the human well-being and sustainable development of especially the developing countries (see Annex XI for a full list). The main areas

are covered by the global small set (Table 9.4), and many of the indicators can also be found in the thematic large set of indicators. Of course, there are many indicators specifically relevant for the less developed countries which were not included in the three indicator sets proposed in chapter eight. However, if the large sets of indicators will also be built on a global scale, these indicators can be added, for example as "policy drivers". Table 9.5 outlines how the MDG indicators fit into the global small set of indicators.

Table 9.5 Place of MDG Indicators in the proposed TFSD Global Set (MDG codes to be found in Annex XI)

Theme TFSD	TFSD Global set (see Table 9.4)	Additional MDG indicators
Subjective well-being	Life satisfaction	
Consumption and income	Final consumption expenditure	***(1.4)***
	Official Development Assistance (ODA) received	***8.1-8.5; 8.9***
	Share of poorest quintile in national consumption (***1.3***)	***1.1; 1.2; 1.6***
	Gender pay gap	***3.1- 3.3***
Nutrition	Malnutrition prevalence	***1.8; 1.9***
Health	Life expectancy at birth	***4.1- 4.3; 5.1-5.6; 6.1-6.10; 7.9***
Labour	Employment rate	***1.5; 1.7***
Education	Educational attainment	***2.1-2.3***
Housing	Urban population in slums (***7.10***)	
Leisure	Leisure time	
Physical safety	Death by assault/homicide rate	
Land and ecosystems	Bird species threatened ***(7.7)***	***7.1; 7.6***
Water	Water abstractions	***7.4-7.6; 7.8***
Air quality	Urban exposure to particulate matter	
Climate	CO_2-emission	***7.2; 7.3***
Energy resources	Consumption	
	Energy dependence	
Non-energy resources	Domestic Material Consumption	
Trust	CPIA public sector management	
Institutions	Voter turnout	
Physical capital	Gross capital formation	
Knowledge capital	R&D expenditures	
Financial capital	Government debt	***8.10***

364. Table 9.6 shows that the global small set of indicators can be supplemented with a large number of indicators. It should be noted that the Millennium Development Goal Indicators are only the tip of the iceberg in terms of the availability of indicators which may be relevant for a global SDI set. Future work should focus on building large global sets of indicators structured along the lines as described in the Chapters seven and eight. Besides, table 9.6 reveals how fruitful it is to link SDI sets to important (global) policy initiatives such as the Millennium Development Goal programme. There are great opportunities to link the work of this Task Force to policy initiatives which are part of the Post Rio+20 agenda.

365. The Sustainable Development Goals (SDG's), which at the moment of writing are under construction, deal with themes which are very relevant from the viewpoint of human well-being and sustainable development.[36] However, a lot of work needs to be done to make these

[36] Even though no precise development goals are identified, in part V of the outcome of the Rio+20 Conference the following topics are listed as relevant: poverty eradication; food security and nutrition and sustainable agriculture; water and sanitation; energy; sustainable tourism; sustainable transport; sustainable cities and human settlements; health and population; promoting full and productive employment, decent work

goals “measurable”. It is important that statisticians will play a role in the shaping of the definite SDG’s, as only in case indicators are available to check how society is performing in the light of the sustainable development goals, society will be informed if it is on the right development path or not. After all, you can only manage what you can measure.

for all and social protection; oceans and seas; small island developing states; least developed countries; landlocked least developed countries; Africa; regional efforts; disaster risk reduction; climate change; biodiversity; forests; desertification, land degradation and drought; mountains; chemicals and waste; sustainable consumption and production; gender equality and the empowerment of women.

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ANNEX I. INTERNATIONAL INITIATIVES ON INDICATORS RELATED TO SUSTAINABLE DEVELOPMENT

366. This annex provides a short overview of some of the international initiatives undertaken to harmonize the measurement of sustainable development and related concepts . These are (in chronological order):[37]

- 1991–Commission for Sustainable Development (UN)
- 2001–European Union Strategy for Sustainable Development (EC)
- 2007–GDP and Beyond (EC)
- 2005–Working Group on Statistics for Sustainable Development (UNECE/OECD/Eurostat)
- 2008–Measurement work on sustainable development, well-being and social progress (OECD)
- 2009–Stiglitz-Sen-Fitoussi Report (France)
- 2010–Sponsorship group on measuring progress, well-being and sustainable development (EC)
- 2012–E-frame (EC)

United Nations Commission on Sustainable Development

367. The United Nations Commission on Sustainable Development (CSD) was established by the United Nations General Assembly in December 1992 to ensure effective follow-up to the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit or Rio Conference.

368. In 1995 a first set of sustainable development indicators was published. The set has been subsequently revised twice (United Nations, 2007). The indicator set gives guidance to countries when choosing its sustainable development indicators.

EU sustainable development strategy

369. The EU Sustainable Development Strategy (EU SDS) was one of the first European initiatives addressing progress, well-being and sustainable development. The European Council adopted the strategy in 2001 and a renewed strategy in 2006. The EU SDS sets out a coherent approach to assess how the EU could more effectively live up to its long-standing commitment to sustainable development.

370. The EU SDS requires regular reporting on progress, drawing on a biennial monitoring report drafted by Eurostat. The monitoring is based on an indicator framework developed by Eurostat with the assistance of a European Statistical System (ESS) Task Force on Sustainable Development Indicators.

European Commission communication "GDP and beyond"

371. In November 2007, the European Commission (together with the European Parliament, the Club of Rome, the WWF and the OECD) organised the Beyond GDP conference (EC, 2007). The conference highlighted a strong demand from European policymakers, economic, social and environmental experts and civil society for developing indicators that could complement with more comprehensive information to support policy decisions.

372. Following up on this request, the "GDP and beyond"-Communication calls for actions to develop indicator sets that provide a more reliable knowledge base for public debate and policy-making. The communication points to the need to improve, adjust and complement GDP with indicators incorporating social and environmental achievements (e.g., improved social cohesion,

[37] Please note that some influential initiatives are not included here, such as the Europe 2020 strategy and the Millennium Development Goals (MDG) because the Annex focuses on initiatives to share experiences and harmonize measurement practices.

accessibility and affordability of basic goods and services, education, public health and air quality) and losses (e.g. increasing poverty, more crime, depleting natural resources).

OECD work on sustainable development, well-being and progress

373. Measurement challenges in the field of sustainable development and well-being were first addressed by the OECD in the report *Sustainable Development – Critical Issues, 2001,* which summarised results of a three-year project, and in *Alternative Measures of Well-being, 2006,* which discussed the limits of GDP as a welfare matrix. In 2005, the OECD started to organise a series of fora on 'Statistics, Knowledge and Policies' (Palermo, 2004; Istanbul, 2007, Busan, 2009, and New Delhi, 2012), which provided a venue for shaping a global consensus on the need to strengthen statistical work in this field. The Istanbul Forum, in particular, led to an international declaration, signed by a number of international organizations, urging "statistical offices, public and private organizations, and academic experts to work alongside representatives of their communities to produce high-quality, facts-based information that can be used by all of society to form a shared view of societal well-being and its evolution over time". The OECD-hosted 'Global Project on of Measuring the Progress of Societies' was established.

374. In 2011, in the context of the OECD 50th Anniversary, the 'OECD Better Life Initiative' was launched. Its main outputs were presented in a report *How's Life?* and a web-based interactive tool, *Your Better Life Index. The report* included a list of well-being indicators based on a framework structured around 11 dimensions describing material conditions and quality of life (i.e. the 'here and now' dimensions used in this report).*The Better Life index* allows users to compare countries' performance based on the *How's Life* indicator set and on user-defined preferences on the importance of the various well-being dimensions. The OECD is now carrying out methodological and research activities under the auspices of the OECD Committee on Statistics to advance the statistical agenda on measuring well-being and green growth.

UNECE/OECD/Eurostat Working Group on Statistics for Sustainable Development

375. This WGSSD is the predecessor of the Taskforce for Measuring Sustainable Development (TFSD) of which this report is the outcome. The history of the WGSSD and the relationship with the TFSD is described in the beginning of this Report.

Stiglitz-Sen-Fitoussi Commission

376. In February 2008, the French President Nicolas Sarkozy established the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), chaired by Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi (often referred to as the Stiglitz Commission). The Commission report identified the limits of GDP as an indicator of economic performance and social progress, considered what additional information might be required for the production of more relevant indicators, and assessed the feasibility of alternative measurement tools (Stiglitz et al, 2009).

Sponsorship group on measuring progress, well-being and sustainable development

377. The Sponsorship Group was an initiative of the European Commission (Eurostat) and the French Statistical Office (INSEE) to respond to the recommendations of the Stiglitz Commission and of the " GDP and Beyond" communication. Following the release of the Sponsorship Group report in 2011, the EU Directors General of the National Statistical Institutes (DGINS) agreed to take this work forward. In September of 2011, a series of actions were adopted by the European Statistical System (ESS) to improve measurement tools in these fields.

E-frame (www.eframeproject.eu)

378. The E-frame consortium, which is funded by the European Commission, is headed by the Italian Statistical Bureau (ISTAT) and Statistics Netherlands (CBS). This consortium consists of a

number of European Statistical institutes, universities and the OECD. It aims at advancing the "beyond GDP" measurement. Several conferences and workshops will be organised where statisticians and members of the academic community will meet to give an impulse to the work on sustainable development in general, and on more detailed topics such as social capital, footprints and the measurement of well-being. The first meeting was held at the OECD in June 2012.

ANNEX II. A DESCRIPTION OF SELECTED COMPOSITE INDICATORS OF WELL-BEING AND SUSTAINABILITY

379. This Annex briefly describes a number of composite indicators that have been proposed to measure different aspects of sustainability. These composite indicators are presented in chronological order of their introduction (descriptions based on Kulig et al., 2009).

Measure of Economic Welfare (MEW)

380. The Measure of Economic Welfare (MEW) constitutes the first version of modified national income. It was constructed by Nordhaus and Tobin (1973) in order to reflect economic welfare more accurately. Three kinds of modifications were introduced. First of all, expenditures with regard to health care and education were treated as investment in human capital whereas expenditures on police and on defence were treated as 'intermediate input', thus not in themselves generating welfare. Secondly, services of capital goods such as durable consumer goods and leisure time were added. Finally, costs of urbanisation were subtracted. The MEW is also known as net economic welfare (NEW). For more discussion of the MEW see Moon (1977) and Samuelson and Nordhaus (1992).

Sustainable National Income (SNI)

381. Sustainable National Income (SNI) was developed by Roefie Hueting (1974). SNI is defined as the maximum attainable level of production whereby, with available technology in the year of calculation, vital environmental functions remain available for years to come. Environmental functions are defined as the possible uses of non-human made physical surroundings, on which humanity is dependent, whether they be producing, consuming, breathing or recreating. To evaluate the development of a country, the distance between 'conventional national income and SNI is calculated. As the SNI is, by definition, lower than the conventional national income, a lower distance implies more sustainability. For more details, see Gerlagh et al. (2002).

Index of Sustainable Economic Welfare (ISEW)

382. Cobb (1989) developed the Index of Sustainable Economic Welfare (ISEW) in order to provide a more reliable monetary indicator of economic welfare and sustainability. The ISEW takes household consumption from the national accounts as a starting point. Household consumption assumes that the more individuals consume, the higher their economic welfare is. The ISEW is calculated by adjusting household consumption for items such as the distribution of income, activities not included in GDP (e.g. housework), the damage caused by economic activities and the net capital endowment of foreign investors. It also takes into account the depletion of natural capital and pollution (which requires valuing non-renewable capital). For more details on ISEW, see Max-Neef (1995), Stockhammer et al. (1997), Castaňeda (1999), Neumayer (1999), Neumayer (2000a), Clarke and Islam (2005) and Pulselli et al. (2006).

Human Development Index (HDI)

383. The Human Development Index (HDI) was created in 1990 by the United Nations Development Programme (UNDP, 1990). The HDI consists of three dimensions which capture relevant aspects of human well-being: health, education and standard of living.. The indicators used to measure these three dimensions have evolved over time, and now include measures of life-expectancy at birth (for health); mean and expected years of schooling (for education); and gross

national income per capita (for standard of living). Indicators for the three dimensions are averaged after a normalisation process. According to Sen (2000), the HDI is the most important application of his capabilities approach to date (Sen, 1985, Nussbaum, 2000 and Clark, 2005). For more details on the HDI see Desai (1995), Neumayer (2001), and the United Nations Development reports published annually since 1990 (hdr.undp.org/en/reports/).

Genuine savings (GS)/National Wealth (NW)

384. The indicators Genuine Savings (GS) and National Wealth (NW), were introduced by Atkinson and Pearce (1993) based on the Hicksian income concept. Together, these indicators represent one way to operationalise the 'monetary capital' approach to sustainability. The indicator of NW aims to describe the sum-total of the monetary vales of the capital stocks that sustain well-being, while the GS measure describes the changes in stocks. The GS measure is the indicator of sustainability used by the World Bank (World Bank, 2006). The starting point for the calculation of GS is gross national saving, from which consumption of fixed capital is subtracted to obtain net national saving. Current expenditures on education are added to adjust for investments in human capital. In addition, both the value of natural resource depletion and the value of damages from pollutants are subtracted. The GS indicator is based on the concept of weak sustainability as it allows for substitution of natural resources by produced and human capital (Hartwick, 1977). A proxy measure of human capital is derived residually, as described in Section 5.7 For more details, see Neumayer (2000b), Arrow et al. (2003), Atkinson and Hamilton (2003), del Mar Rubio (2004), Pezzey et al. (2006) and Pillarisetti (2005).

Genuine Progress Indicator (GPI)

385. The Genuine Progress Indicator (GPI) differs slightly from the ISEW in terms of the specific categories of adjustments included (Cobb et al., 1995). To calculate the GPI, consumption expenditure is weighted with an index of income inequality. Secondly, the following monetary benefits are added: volunteer work and the value of time spent on household work; parenting; the value of services of consumer durables (e.g. cars) and the services of highways and streets. Finally, three categories of expenses are deducted from the GPI: defensive expenditures[38]; social costs (such as the cost of divorce, crime or loss of leisure time); and depreciation of environmental assets and natural resources. More details regarding GPI can be found in Anielski and Rowe (1999), Hamilton (1999), Neumayer (2000a) and Costanza et al. (2004).

Sustainable Net Benefit Index (SNBI)

386. The Sustainable Net Benefit Index (SNBI) was introduced by Lawn and Sanders (1999). The authors argue that GDP is a poor indicator of welfare because it does not distinguish between costs and benefits. The SNBI is defined by the difference between two accounts: benefits of economic activity (e.g. services from volunteer work) and the social costs of economic activity (e.g. noise pollution).

[38] Some of the expenditure in the economy relates to the avoidance of using the sink function of the environment. This includes environmental protection expenditures and may include other expenditures of a type which might be described generally (albeit not very precisely) as defensive expenditure (SEEA, 2003, section 1.57)

ANNEX III. CLASSIFICATION SCHEMES

387. In this Annex, a number classification schemes are presented. In most cases the relationship with the TFSD classification scheme is also provided.

Table III.1. Concordance table between the SNA and the SD themes identified in the current SD framework

SNA asset list	Theme in the TFSD framework
Produced non-financial assets (AN1) Fixed assets by type of asset (AN11) Inventories by type of inventory (AN12) Valuables (AN13)	EC1. Physical capital
Intellectual property products (AN117)	EC2. Knowledge capital
Natural resources (AN21)	See Natural Capital
Contracts, leases and licences (AN22) Purchases less sales of goodwill and marketing assets (AN23)	
Monetary gold and SDRs (AF1) Currency and deposits (AF2) Debt securities (AF3) Loans (AF4) Equity and investment fund shares/units (AF5) Insurance, pension and standardized guarantee schemes (AF6) Financial derivatives and employee stock options (AF7) Other accounts receivable/payable (AF8)	FC1. Financial capital

Table III.2. Concordance table between the SEEA and the SD themes identified in the current SD framework

SEEA asset list	Theme in the SD framework
EA.111 Fossil fuels	NC1. Energy resources
EA.112 Metallic minerals *EA.113 Non-metallic minerals*	NC2. Non-energy resources
EA.2 Land and surface water (hectares) *EA.14 Biological resources* EA.3 Ecosystems *EA.12 Soil resources*	NC3. Land and ecosystems
EA.13 Water resources	NC4. Water
	NC5. Air quality
EA.33 Atmospheric systems	NC6. Climate
EA.M Memorandum item: intangible environmental assets EA.M1 Mineral exploration EA.M2 Transferable licences and concessions for the exploitation of natural resources EA.M3 Tradable permits allowing the emission of residuals EA.M4 Other intangible non-produced environmental assets	

Table III.3. Classification of Ecosystems used in "The Economics of Ecosystems and Biodiversity" (TEEB) (2003)

	LEVEL 1 (Biomes)		LEVEL 2 (ecosystems)
1	Marine / Open ocean	1.0	Marine / Open ocean
		1.1	Open ocean
		1.2	Coral reefs (*, (#
2	Coastal systems	2.0	Coastal systems (excluding wetlands)
		2.1	- Seagrass/algae beds
		2.2	- Shelf sea
		2.3	- Estuaries
		2.3	- Shores (rocky & beaches)
3	Wetlands	3.0	Wetlands – general (coastal & inland)
			(coastal wetlands)
		3.1	- Tidal Marsh (coastal wetlands)
		3.2	- Mangroves (#
			(Inland wetlands)
		3.3	- Floodplains (incl. swamps/marsh)
		3.4	- Peat-wetlands (bogs, fens, etc.)
4	Lakes/Rivers	4.0	Lakes/Rivers
		4.1	- Lakes
		4.2	- Rivers
5	Forests	5.0	Forests – all
			(Tropical Forest)
		5.1	- Tropical rain forest (#
		5.2	- Tropical dry forest
			(Temperate forests)
		5.3	- Temperate rain/Evergreen
		5.4	- Temperate deciduous forests
		5.5	- Boreal/Coniferous forest
6	Woodland & shrubland	6.0	Woodland & shrubland ("dryland")
		6.1	- Heathland
		6.2	- Mediterranean scrub
		6.3	- Various scrubland
7	Grass/Rangeland	7.0	Grass/Rangeland
		7.1	- Savanna etc
8	Desert	8.0	Desert
		8.1	- Semi-desert
		8.2	- True desert (sand/rock)
9	Tundra	9.0	Tundra
10	Ice/Rock/Polar	10.0	Ice/Rock/Polar
11	Cultivated	11.0	Cultivated
		11.1	Cropland (arable land, pastures, etc.)
		11.2	Plantations / orchards / agro-forestry, etc.
		11.3	Aquaculture / rice paddies, etc.
12	Urban	12.0	Urban

Source: Based on mix of classifications, mainly MA (2005a) and Costanza et al. (1997) which in turn are based on classifications from US Geol. Survey, IUCN, WWF, UNEP and FAO.
*) usually placed under "coastal" but it is proposed to put this under "marine".
#) These three ecosystems are dealt with separately in the monetary valuation (chapter 7).

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Table III.4. Common International Classification of Ecosystem Services (CICES) - Main service types of ecosystems

PROVISIONING SERVICES
- 1 Food (e.g. fish, game, fruit)
- 2 Water (e.g. for drinking, irrigation, cooling)
- 3 Raw Materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)
- 4 Genetic resources (e.g. for crop-improvement and medicinal purposes)
- 5 Medicinal resources (e.g. biochemical products, models & test-organisms)
- 6 Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)

REGULATING SERVICES
- 7 Air quality regulation (e.g. capturing (fine) dust, chemicals, etc)
- 8 Climate regulation (incl. C-sequestration, influence of veg. on rainfall, etc.)
- 9 Moderation of extreme events (e.g. storm protection and flood prevention)
- 10 Regulation of water flows (e.g. natural drainage, irrigation and drought prevention)
- 11 Waste treatment (esp. water purification)
- 12 Erosion prevention
- 13 Maintenance of soil fertility (incl. soil formation)
- 14 Pollination
- 15 Biological control (e.g. seed dispersal, pest and disease control)

HABITAT SERVICES
- 16 Maintenance of life cycles of migratory species (incl. nursery service)
- 17 Maintenance of genetic diversity (esp. gene pool protection)

CULTURAL SERVICES
- 18 Aesthetic information
- 19 Opportunities for recreation & tourism
- 20 Inspiration for culture, art and design
- 21 Spiritual experience
- 22 Information for cognitive development

ANNEX IV. IDEAL INDICATORS

388. This annex explains which indicators would be "ideal" to measure specific aspects of sustainable development from a conceptual point of view. These are indicators which are the preferred theoretical object of measurement.

389. The annex discusses the 20 themes identified in the report (subjective well-being, consumption and income, nutrition, health, labour, education, housing, leisure, physical safety,, land and ecosystems, water, air quality, climate, energy resources, non-energy resources, trust, institutions, physical capital, knowledge capital, and financial capital) (see table 7.3 for details) and the monetary aggregates for capital.

390. The Annex uses the indicator typology introduced in section 7.4 that makes a distinction between the "core indicators" and "policy levers". In addition, other potential indicators are identified that may be relevant for specific countries. A distinction is also made between the core indicators at the national level (i.e. 'Here and now' and 'Later') and the core indicators for the transboundary impacts ('Elsewhere').

391. As well as the indicators presenting national totals or averages, the aspect of the distribution within the population is also important. For those themes where the aspect of inequality is most relevant, the ideal indicators of distribution are discussed.

392. Subjective Well-being

Core indicators (national): Conceptually an overall measure of the subjective well-being of the population is required. Currently "life satisfaction" is considered an appropriate indicator in the literature.

393. Consumption and income

Core indicators (national): This theme includes various macro-economic aggregates as well as the drivers of economic growth. The Stiglitz-Sen-Fitoussi report (2009) emphasized the importance of using household income and consumption to measure economic progress.

Policy lever indicators: Indicators for the drivers of economic growth, such as productivity and competitiveness, could be options.

Core indicators (transboundary impacts): Here the direct income measures from the developed world to the developing countries can be used (e.g. Official Development Assistance (ODA) and remittances). The imports from developing countries could be viewed as an indicator of wealth creation in those counties.

Other potential indicators: For many countries it is probably appropriate to have specific measures on poverty.

Indicators for distribution: The way in which income is distributed amongst various groups provides important information about the inequality in society. Distinction may be made according to gender, ethnicity, age, etc. depending on the society. Examples such as the Gini coefficient or the gender pay gap are well known.

394. Nutrition

Core indicators (national): A healthy diet is an important driver of health and human well-being in general. However, the problems related to nutrition will be very different in different countries. In developed countries, issues of obesity are important while in developing countries indicators for malnutrition should be used.

395. Health

Core indicators (national): The indicator should provide a summary value for the total physical and mental health of the population. Life expectancy is not a perfect measure of physical health

but is very prevalent in SDI sets. Similarly, the suicide rate is often used in many countries as sort of proxy for mental well-being. Conceptually it might be fruitful to create indicators which take a "stock" perspective. This could be done by showing the number of years in good health that can be expected in future. For example, a number of indicators exist in the literature which track the "remaining healthy life years". This is also sometimes referred to as "years of healthy life remaining".

Policy lever indicators: The level of health expenditures is an obvious conceptual sub-indicator, but other indicators could be also used. The analysis commonalities in existing SDI sets showed many additional indicators ranging from causes of death to medical facilities.

Other potential indicators: Some country-specific lifestyle indicators (prevalence of smoking, drinking and health lifestyle) or problems of undernourishment are clearly also important driving forces for overall physical and mental health. Apart from the above Policy lever indicators one might also have indicators specific for the health situation in countries. Examples include: the prevalence of physicians and hospital beds per person but also indicators that are related to major diseases such as HIV/AIDS and malaria.

Indicators for distribution: Given that health is an important determinant of well-being it is important to measure how it is distributed in society (according to gender, ethnicity, age, socio-economic group).

396. Labour

Core indicators (national): The participation rate, or unemployment, seems to be good indicator for this dimension, as joblessness has a large impact on human well-being.

Policy lever indicators: Additional indicators on the labour market, such as hours worked, the average exit age from labour market and replacement rates may be useful.

Other potential indicators: For some countries the working conditions or child labour will also be relevant.

Indicators for distribution: Given that labour is an important determinant of income and well-being, it is important to measure how it is distributed in society (according to gender, ethnicity, age, socio-economic group).

397. Education

Core indicators (national): For the human well-being aspects of education the average level of competencies and education are sought. Happiness literature has shown that life satisfaction grows as these characteristics grow in the population. The level of skills and competencies goes beyond formal education but these indicators are regularly used. There are however also measures of competencies such as PISA scores (for the youth) as well as PIAAC scores (for whole population) (OECD).

Policy lever indicators: As Policy lever indicators one might use the expenditures on education as well as indicators that threaten the overall educational level (e.g. early school leavers).

Other potential indicators: In the developed world, access to education is more or less universal. This is not the case for the developing world where it would be good to measure enrolment rates at every level of education.

Indicators for distribution: Given that education is an important determinant of human well-being in the 'Here and now' but is also an important determinant for future earnings and well-being, it is important to measure how it is distributed in society (according to gender, ethnicity, age, socio-economic group).

398. Housing

Core indicators (national): An overall volume measure of the quantity/quality of the dwellings that people live in is sought. Of course, the housing conditions are multifaceted and difficult to

measure with a single figure. Indicators that measure certain aspects are living space (square meters per person) or the number of dwellings without deficiencies (leaking roofs etc.).
Policy lever indicators: Policy lever indicators include the investment in dwellings as well the building of new houses.
Other potential indicators: For developing countries it is probably good to have indicators about people with inadequate housing (slum dwellers, homeless people).
Indicators for distribution: Given that housing is an important determinant of well-being it is important to measure how it is distributed in society (according to gender, ethnicity, age, socio-economic group).

399. Leisure
Core indicators (national): A measure of the quantity and quality of leisure is required. In practice it is hard to measure the quality of leisure but it is possible to measure the time spent on leisure through time use surveys.

400. Physical safety
Core indicators (national): The overall level of crime would be a desired indicator. However, the severity of the crimes may vary significantly and so it is conceptually problematic to come to a single indicator. Proxies that may be used include the amount of personal crimes or violent crimes.
Policy lever indicators: Here one might want to measure expenditures on policing or the number of police staff.
Other potential indicators: Some countries experience natural hazards, which is important for the physical safety.

401. Land and ecosystems
Core indicators (national): The area and value of land should be measured, as well as the biodiversity/ecosystems. There is no consensus about an overall measure of biodiversity but there are quite a few initiatives in the field of monetisation at present (Kumar, 2010). Soil quality is difficult to measure although it is possible to measure the quality of the soil in terms of the concentration of pollutants such as nitrates and phosphates in the soil.
Policy lever indicators: The indicators on extinct or threatened species as well as the land area for forest and nature may be used. The emissions to soil should be measured.
Core indicators (transboundary impacts): An interesting aspect of land is that, through the consumption, countries are implicitly "using" land of other countries. This creates pressures on the biodiversity in those regions. A well-known indicator is the ecological footprint. It is based on consumption and land use but it also contains the fictive amount of forest that is required to compensate for CO_2 emissions. A "land footprint", without the hectares for CO_2 compensation, could also be calculated. A footprint is still a "national" indicator but it could become an international indicator by taking into account the land use in foreign countries.
Other potential indicators: For some countries, the issue of land erosion may be very relevant.

402. Water
Core indicators (national): The overall quality of water is very difficult to measure but can be approached using the concentration of certain pollutants. Also the Biochemical Oxygen Demand (BOD) index is often used.
Policy lever indicators: The emissions to water are relevant. The extraction and use of water would be appropriate policy lever indicators.
Other potential indicators: The overall amount of (fresh) water is only relevant in countries where it is a scare commodity. Specific information about the access to water is important since this is not a universal resource for all citizens in the world.
*Core indicators (*transboundary impacts*):* Similarly to the land footprint, water footprint could be calculated.

403. Air quality

Core indicators (national): The overall air quality is difficult to measure, but measuring certain pollutants that affect health provides a good proxy (particulate matter, tropospheric ozone).
Policy lever indicators: The emissions of these pollutants.
Other potential indicators: In some countries smog may be a common phenomenon and should be measured.

404. Climate

Core indicators (national): Since climate is a global stock it should be measured by the CO_2 concentration or the global temperatures. Also the state of the ozone layer would be a good indicator of the climatic system. If one wants to assign a national responsibility to the reductions in these capital stocks one would need to see what the accumulated emissions are (see for example Botzen et al, 2008). For example, using the CDIAC database it is possible to calculate the (cumulative) historical CO_2 emissions of countries.
Policy lever indicators: The greenhouse gas emissions (and ozone precursors) and their intensity of should be measured.
Core indicators (transboundary impacts): The embodied carbon footprint of consumption (at least the part that is in foreign countries) and the "carbon balance of trade" can be measured (see land).

405. Energy resources

Core indicators (national): The total physical and monetary stock of energy resources. The valuation of these resources is covered by the SEEA-2012.
Policy lever indicators: The extraction and discoveries are important policy lever indicators. Also the energy use, energy intensity and share of renewable energy are relevant.
Core indicators (transboundary impacts): For the transboundary impacts the direct imports from other countries (and specifically developing countries) can be used.

406. Non-energy resources

Core indicators (national): The total physical and monetary stock of non-energy resources. The valuation of these resources is covered by the SEEA-2012.
Policy lever indicators: The extraction and discoveries are important plicy lever indicators. Also the material use, intensity and waste are very relevant.
Core indicators (transboundary impacts): see energy resources.

407. Trust

Core indicators (national): The quality and quantity of social relationships should be measured (generalized trust), trust within subsections of society (family/neighbourhood) as well as the trust between groups in society (bridging social capital). In practice, these are very difficult concepts to measure. The indicators of generalised trust are often used to measure overall trust (respondents are asked whether they trust other members of society that they do not know). There are also social survey questions that can be used for family and neighbourhoods. Finally, bridging social capital may be estimated by certain questions that indicate social exclusion (e.g. discrimination).
Policy lever indicators: Here the investment perspective is important. The time spent on family, friends and volunteering may be measured.

408. Institutions

Core indicators (national): This should be reflection of the quality of the institutions in society. This is of course very difficult because the institutions are very heterogeneous. There are however overall indicators in which the general public are asked to asses the quality of

institutions in their country. The work of De Soto is very useful because it measures the time it takes to overcome bureaucratic procedures.

Other potential indicators: In the case of some countries it may be good to add indicators for the level of corruption.

Indicators for distribution: Access to services and institutions may vary significantly between various groups is society. It is therefore important to important to measure the extent to which institutions are available to various groups in society (according to gender, ethnicity, age, socio-economic group).

409. Physical capital

Core indicators (national): This capital stock should provide a summary value of the stock of machines, buildings and infrastructure. The methods do to this are summarized in the handbook on "Measuring Capital" (OECD)

Policy lever indicators: Overall gross capital formation (investment) or specific investments (ICT) are common in some SDI sets.

Other potential indicators: For developing countries it may be useful to measure some non-monetary aspects: length of paved roads, railways, number of mobile phones, internet connections, etc.

410. Knowledge capital

Core indicators (national): The total stock of knowledge should be measured. Although knowledge is far broader concept, the stock of R&D capital is often taken as a proxy. The conceptual aspects of measuring this type of capital are currently being developed to implement the SNA 2008.

Policy lever indicators: R&D investments (split into public and private) may be useful. Also other indicators for innovation or patents may be used.

411. Financial capital

Core indicators (national): The national totals of assets minus liabilities from the SNA may be used.

Policy lever indicators: Changes in the net assets and liabilities or public debt and deficits.

412. Monetary aggregates

Core indicators (national): For these indicators the monetary values for economic capital, human capital, natural capital and social capital are used. The methodology for economic and natural capital can be derived from handbooks (SNA, SEEA, Measuring capital (OECD)). However, for natural and social capital, methods are problematic or even non-existent. The "Economic Wealth" aggregate is the sum of these capital stocks.

Policy lever indicators: Investments in these capital stocks.

ANNEX V. COMMONALITES BETWEEN INDICATOR SETS USED TO MEASURE SUSTAINABLE DEVELOPMENT

413. This Annex presents the analysis of ten SDI sets used by selected countries and international organisations for the purpose of measuring sustainable development. Such analysis aims to identify the most commonly used indicators for the specific themes and sub-themes of sustainable development prposed in this report. The extent to which indicators for the different sub-themes are already used in existing SDI sets is one of the criteria used in this report for inclusion in the large and small sets of indicators put forward in Chapter *. For a full discussion of the selection process see Annex VI.

414. The SDI sets from the institutes/countries that are members of the TFSD are analysed in Table V.1. To allow for a conceptually sound comparison, only the indicator sets which explicitly aim to measure sustainable development are covered. This means that indicator sets that are mainly focused on the 'here and now, such as Australia's Measures of Progress or the OECD's "How's Life?" indcators, are not included here. The SDI sets of the following countries and organisations have been analysed (the abbreviations are detailed in Table V.1):

- United Nations Commission for Sustainable Development (UNCSD)
- Eurostat's Sustainable Development Indicators
- World Bank ("Where is the wealth of nations?") (WB)
- France (FRA)
- Germany (DEU)
- New Zealand (NZL)
- Netherlands (NLD)
- Norway (NOR)
- Switzerland (CHE)
- United Kingdom(GBR)

415. The column of Table V.1 on 'Total per indicator' provides information on whether the indicators listed as rows are included in the SDI set of a specific country/organization. The column 'Total per sub-theme' summarise the information per sub-theme: for example, under the theme 'Consumption and income', the sub-theme 'Productivity' has two indicators, 'Labour productivity' and 'Output per worker'. Overall, five SDI sets include an indicator for 'Labour productivity' while one SDI set includes an indicator for 'Output per worker'; therefore, overall, six SDI sets include an indicator on this sub-theme.

Table V.1. Commonalities between ten indicator sets

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
TH1. Subjective well-being	Life satisfaction	Life satisfaction							X		X	X	3							X		X	X	3
TH2. Consumption and income	Consumption	Final/Household consumption expenditure		X					X	X			3		X					X	2			4
	Income	National income		X		X		X		X	X		5		X		X		2					4
		Disposable income																			X			1
		Household income																				X		1
	Saving	Gross savings	X	X									2	X										1
		Net savings												X										1
		Household saving rate													X									1
	Gross Domestic Product	Gross Domestic Product (GDP)	X	X		X	X		X			X	6	X	X		X		X	X			X	6
	Productivity	Labour productivity	X	X					X	X	X	X	6	X	X					X	X	X		5
		Output per worker																					X	1
	Competitiveness	Unit labour costs	X	X						X			3	X										1
		Real effective exchange rate													X									1
		Diversity of exports																			X			1
	Official Development Assistance	Official Development Assistance	X	X		X	X	X	X		X	X	8	X	X		X	X	X	X		X	X	8
		Official development assistance, by income group													X									1
		ODA to poor countries																				X		1
		Untied official development assistance													X									1
		Bilateral official development assistance by category													X									1
		Total EU financing for developing countries, by type													X									1
		Official development assistance per inhabitant													X									1
	Remittances	Remittances as percentage of GNI	X						X		X		3	X						X		X		3
	Imports from developing countries	Imports from LDCs/developing countries	X	X			X	X	X		X		6	X	3			X	X	X				7
		Fair trade																				X		1
	Trade barriers	Average tariff barriers imposed on exports from developing countries and LDCs	X	X							X		3	X										1
		Duty-free imports from developing countries																				X		1
		Aggregated measurement of support for agriculture													X									1
	Distribution-Income-	Income inequality	X	X		X			X	X	X		6		X		X				X	X		4

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	Total	Poverty rate															X							1
		Population living below national poverty line												X								X		2
		Persons at-risk-of-poverty after social transfers													X									1
		Persistent-at-risk-of-poverty rate													X									1
		Relative median at-risk-of-poverty gap													X									1
		Poverty in living conditions															X							1
		Proportion of population below $ 1 a day												X										1
		Severely materially deprived persons													X									1
		Ratio of share in national income of highest to lowest quintile												X							X			2
		Number of households heavily in debt															X							1
		Population with low incomes																			X			1
	Distribution-Income-Labour status	Working poor		X							X		2									X		1
		In work at-risk-of-poverty rate													X									1
	Distribution-Income-Gender	Gender pay gap/Gender income inequality		X		X	X		X		X		5		X		X	X		X		X		5
		Persons at-risk-of-poverty after social transfers, by gender													X									1
	Distribution-Income-Ethnicity	Pay equality by ethnicity								X			1								X			1
	Distribution-Income-Age	Children in relative low-income households		X								X	2										X	1
		Pensioners in relative low-income households																					X	1
		At-risk-of-poverty rate, by age group													X									1
		At-risk-of-poverty rate of elderly people													X									1
	Distribution-Income-Household type	At-risk-of-poverty rate, by household type		X									1		X									1
	Distribution-Income-Education	At-risk-of-poverty rate, by highest level of education attained		X									1		X									1
	Distribution-Income-Regional	Dispersion of regional GDP per inhabitant		X									1		X									1
	Subjective	Satisfaction with material/financial situation							X	X	X		3							X	X			2
		Satisfaction with income inequality																		X				1
		Attitude towards development assistance																				X		1
TH3. Nutrition	Obesity	Proportion of obese people	X	X			X		X	X	X	X	7					X		X		X		4
		Childhood obesity																					X	1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	(Mal)nutrition	Nutritional status of children												X										1
		Consumption of certain foodstuffs per inhabitant													X									1
		Proportion of people consuming a healthy diet																					X	1
TH4. Health	Life expectancy	Life expectancy at birth	X	X		X		X	X				5	X			X		X	2				4
		Life expectancy at age 65													X									1
	Healthy life expectancy	Health life expectancy at birth	X	X		X			X	X	X	X	7	X	X		X			2	X	X	2	9
		Health life expectancy at age 65													X									1
	Mental health	Suicide death rate	X	X		X			X	X	X	X	7	X	2		X				X	X	X	7
		Prevalence of psychological distress																			X			1
		Mental well-being															X			X		X		3
	Health expenditures	Health expenditure		X					X		X		3							X		X		2
		Expenditure on care for the elderly													X									1
	Health care facilities	Percent of population with access to primary health care facilities	X			X				X			3	X										1
		Unmet healthcare needs												X			X							2
		Avoidable hospital admissions																			X			1
	Contraception	Contraceptive prevalence rate	X										1	X										1
	Immunization	Immunization against infectious childhood diseases	X							X			2	X							X			2
	Mortality	Under-five mortality rate	X				X						2	X										1
		Premature mortality																X						1
	Ciculatory diseases	Death rates from circulatory disease										X	1										X	1
	Cancer	Death rates from cancer								X		X	2										X	1
		Cancer-survival probabilities																			X			1
	Chronic diseases	Death rate due to chronic diseases, by gender		X									1		X									1
	HIV/malaria etc	Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis	X										1	X										1
	Road accidents	People killed in road accidents		X								X	2		X								X	2
	Work related ailments	Serious accidents at work		X		X							2		X		X							2
		Occupational diseases															X							1
	Smoking prevalence	Prevalence of tobacco use	X				X		X			X	4	X				X		X			2	5
	Drinking water	Population with drinking water supply meeting standards	X							X			2	X							X			2
	Sanitation	Proportion of population using an improved sanitation facility	X	X									2	X										1
		Population connected to urban waste water treatment with at least secondary treatment													X									1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	Lifestyle/Exercise	Prevalence of healthy lifestyles								X	X		2								X			1
		Health-relevant behaviour: physical exercise																				X		1
	Distribution-Health	Self reported met need for medical examination or treatment, by income quintile		X								X	2		X								X	2
		Suicide death rate, total by age group													X								X	2
	Subjective	Perceived health							X				1							X				1
TH5. Labour	Employment rate	Employment-population ratio	X	X			X	X	X	X		X	7	X									X	2
		Employment rate													X			X						3
		Participation rate																		X	X			2
		Disability pensioners and persons receiving work assessment allowance as a percentage of the population																	X					
	Labour force	Labour force							X				1							X				1
	Hours worked	Hours worked							X				1							X				1
	Un(der)employment	Unemployment rate	X	X		X			X	X	X	X	7				X			X	X	X	X	5
		Long-term unemployment rate													X		X							2
		Under-employment rate															X							1
		Vulnerable employment												X										1
	Retirement	Aggregate replacement ratio	X	X					X				3		X									1
		Dependency ratio												X	2									3
		Average exit age from the labour market													X					X				2
	Unpaid work	Formal paid work outside the home								X			1								X			1
	Brain drain								X				1							X				1
	Other	All-day care provision for children					X						1					X						1
	Distribution-Labour-Gender	Professional position by gender	X	X							X		3									X		1
		Share of women in wage employment in the non-agricultural sector												X										1
		Employment rate, by gender													X									1
		Unemployment rate, by gender													X									1
	Distribution-Labour-Age	Senior citizens' employment rate		X		X					X		3				X							1
		Employment rate of older workers													X									1
		Unemployment rate, by age group													X									1
		Youth unemployment rate																				X		1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	Distribution-education	Employment rate, by highest level of education attained		X									1		X									1
	Distribution-region	Dispersion of regional employment rates, by gender		X									1		X									1
	Distribution-overall	Population living in workless households: children	X	X								X	2										X	1
		Population living in workless households: working age																					X	1
		Persons living in households with very low work intensity													X									1
TH6. Education	Educational attainment	Educational attainment level of adults	X					X	X	X			4	X					X	2	X			5
	Computer skills	Individuals' level of computer skills		X									1		X									1
		Individuals' level of internet skills													X									1
	Basic competencies	Maths skills	X	X		X	X		X	X	X		7					X		X				2
		Adult literacy rate												X							X			2
		Reading skills of 15-years-olds													X		X					X		3
	Education expenditures	Education expenditures		X					X				2		X					X				2
	Participation in education	25-year-old university graduates	X	X		X	X		X	X	X	X	8					X						1
		Gross intake ratio to last grade of primary education												X										1
		Net enrolment rate in primary education												X										1
		Participation in tertiary education																			X	X		2
		Early school-leavers													X		X	X	X	X		X	X	7
		Education level of young people																		X			X	2
		Access to early childhood education																			X			1
	Life long learning	Life long learning	X	X		X			X				4	X	X		X			X				4
	Knowledge of SD	Barometer of knowledge by households of the notion of sustainable development				X							1				X							1
	Distribution-Education	Early school leavers by citizenship		X		X	X				X		4				X					X		2
		Foreign school leavers with a school leaving certificate																X						1
		Reading skills of 15-years-olds by socio-economic background																				X		1
		Persons with low educational attainment, by age group													X									1
		Proportion of higher diplomas among the 25-34 age group and comparison with the 25.64 age group															X							1
	Subjective-educational attainment	Satisfaction with own education							X				1							X				1
TH7.	Housing stock	Housing/Dwelling stock							X			X	2							X			X	2

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
Housing	Housing density	Average density of new housing										X	1										X	1
	Investments in housing	Increase in land use for housing and transport					X						1					X						1
	Quality of housing	Living without housing deprivation							X			X	2							X				1
		Vulnerable households in the private sector in homes below the decent homes standard																					X	1
		Social sector housing																					X	1
	Slums/rough sleepers	Number of rough sleepers										X	1										X	1
		Number of households in temporary accommodation																					X	1
	Neighbourhood	Problems in the neighbourhood							X				1							X				1
	Housing affordability	Housing affordability								X			3								X			1
	Housing costs	Housing costs							X		X		2									X		1
		Total share of housing costs (tenants and owner-occupiers)																		X				1
		Average monthly rent																		X				1
	House price	Average house price							X				1							X				1
	Distribution-Housing	Distribution-housing																						
	Subjective-Quality of housing	Satisfaction with housing							X			X	2							X			2	3
		Not enough space																		X				1
	Subjective-Affordability	Perceived housing costs							X				1							X				1
	Subjective-Neigbourhood	Satisfaction with residential environment							X				1							X				1
TH8. Leisure	Time use	Leisure time							X				1							X				1
	Subjective	Satisfaction with leisure time							X				1							X				1
TH9. Physical safety	Crime	Deaths from assault/homicide rate	X			X	X		X	X	X	X	7	X			X			X	X			4
		Violent crime																				X		1
		Crime survey and record crime for vehicles																					X	1
		Crime survey and record crime for domestic burglary																X					X	2
		Crime survey and record crime for robbery																					X	1
		Reported crime																		X				1
		Registered crime																		X				1
	Suspects/prisoners	Underage suspects							X				1							X				1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		Number of prisoners																		X				1
	Safety expenditures	Safety expenditures							X				1							X				1
	Police	Number of police officers							X				1							X				1
	Natural hazards	Human and economic loss due to natural disasters	X									X	2	X										1
		Flooding																					X	1
		Percentage of population living in hazard prone areas												X										1
	Subjective-trust	Trust in the police					X		X				2							X				1
		Trust in the justice system																X		X				2
	Subjective-crime	Not feeling safe					X		X	X		X	4							X				1
		Impact of fear of crime on quality of life																X			X			2
		Fear of crime: car theft																					X	1
		Fear of crime: burglary																					X	1
		Fear of crime: physical attack																					X	1
		Fear of terrorist attacks																		X				1
TH10. Land and ecosystems	Land	Population density							X		X		2							X		X		2
	Land use	Land use change	X	X				X		X	X	X	6	X										1
		Area of land used for farming																			X			1
		Build-up areas													X									1
		Land use for settlement																				X		1
		Area covered by agriculture, woodland, water or river, urban																					X	1
		Livestock density index													X									1
		New dwellings built on previously developed land or through conversions																					X	1
		All new development on previously developed land																					X	1
		Irreversible losses of biologically productive areas																	X					
		Arable and permanent cropland area												X								X		2
	Organic farming	Organic farming	X	X		X							3	X	X		X							3
		Area for agri-environmental commitment													X									1
	Protected areas	Proportion of terrestrial area protected, total and by ecological region	X	X					X	X		X	5	X										1
		Nature reserves																		X				1
		State of preservation																		X				1
		Management effectiveness of protected areas												X										1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		Sufficiency of sites designated under the EU Habitats directive													X									1
		Land covered by environmental schemes																					X	1
		Area of native land cover																			X			1
	Landscape quality	Landscape fragmentation									X		1									X		1
		Landscape quality																X	X					2
	Soil quality	Contaminated soil sites	X			X			X	X		X	5								X			1
		Soil health																			X			1
		Land degradation												X										1
		Land affected by desertification												X										1
		Changes in soil artificialisation															X							1
		Versatile soil extinction																			X			1
		Nitrogen surplus																		X	X			2
		Phosphorus surplus																		X	X			2
		Area of sensitive habitats exceeding critical loads for acidification and eutrophication																					X	1
		Hill country erosion																			X			1
	Emissions to soil	Fertilizer use efficiency	X			X							2	X										1
		Use of pesticides												X			X							2
	Species/Ecosystems	Priority species status	X	X		X	X		X	X	X	X	8										X	1
		Bird index													X		X					X	X	4
		Priority habitat status																					X	1
		Abundance of selected key species												X										1
		Species diversity																X	X					2
		Distribution of selected native species																			X			1
		Area of selected key ecosystems												X										1
		Distribution of selected pest animal and weed species																			X			1
		Abundance of invasive alien species												X										1
		Fragmentation of habitats												X										1
	Threatened species	Change in threat status of species	X						X	X			3	X										1
		Number of threatened species																			X			1
		Population Red List species																		X				1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		Population not Red List species																		X				1
	Forests	Proportion of land area covered by forests	X	X							X		3	X										1
		Percent of forest trees damaged by foliation												X	X									2
		Area of forest under sustainable forest management												X										1
		Forest increment and fellings													X									1
		Ecological quality of forests																				X		1
		Deadwood													X									1
	Fish/Coral	Proportion of fish stocks within safe biological limits	X	X		X		X		X		X	6	X										1
		Fish catches taken om stocks outside safe biological limits													X									1
		Area of coral reef ecosystems and percentage live cover												X										1
		Size of fishing fleet													X									1
		Proportion of catches at EU level only based on the state of fishery stocks															X							1
		Proportion of assessed fish stocks below target levels																	X		X			2
		Nature index. Ocean and coastal ecosystems																	X					1
		Nature index. Inland waters and terrestrial ecosystems																	X					1
		Sustainability of fish stocks around the UK																					X	1
	Footprint	Ecological footprint							X		X		2									X		1
		Land use as a result of consumption/Land footprint																		X				1
	Subjective	Satisfaction with green areas							X				1							X				1
TH11. Water	Resources	Water resources																						
	Abstraction	Surface- and groundwater abstraction		X					X			X	3		X					X			X	3
	Consumption	Proportion of total water resources used	X									X	2	X										1
		Litres per person per day																					X	1
	Allocation	Water allocation compared with total water resource								X			1								X			1
	Intensity	Water use intensity	X										1	X										1
	Wastewater treatment	Wastewater treatment	X										1	X										1
	Water quality	Presence of faecal coliforms in freshwater	X	X		X			X	X	X	X	7	X										1
		Biochemical oxygen demand in water bodies												X										1
		Bathing water quality												X										1
		Marine trophic index												X										1
		Biochemical oxygen demand in rivers													X									1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		Nitrate content in groundwater																				X		1
		Phosphorus content in selected lakes																				X		1
		Synthetic indicator of surface water quality															X							1
		Quality of surface water																		X				1
		Nitrogen in rivers and streams																			X			1
		Biological health of rivers and streams																			X			1
		Lake water quality																			X			1
		Groundwater quality																			X			1
		Bacterial pollution at coastal swimming spots, rivers and lakes																			X			1
		Rivers of good biological quality																					X	1
		Rivers of good chemical quality																					X	1
	Emissions to water	Emissions to water																						
	Water stress	Water stress										X	1										X	1
	Footprint	Water footprint																						
TH12. Air quality	General air pollution	Ambient concentration of air pollutants in urban areas	X	X			X	X		X		X	6	X										1
		Index of production of toxic chemicals, by toxicity class													X									1
		Air pollution																X	X		X			3
		Assessment of local environmental quality																					X	1
	PM concentration	Particulate matter concentration		X					X		X	X	4									X	X	2
		Urban population exposure to air pollution by particulate matter													X					X				2
	PM emissions	Emissions of particulate matter by source sector		X								X	2		X								X	2
	Ozone concentration	Urban population exposure to air pollution by ozone		X					X			X	3		X					X			X	3
	Ozone emissions	Emissions of ozone precursors by source sector		X									1		X									1
	Acidifying emissions	Emissions of acidifying substances by source sector		X					X			X	3		X					X				2
		Emissions of NOx																					X	1
		Emissions of NH_3																					X	1
		Emissions of SO_2																					X	1
	Distribution	Environmental equality										X	1										X	1
	Noise	Proportion of population living in households complaining that they suffer from noise		X							X		2		X									1
		Persons affected by noise																				X		1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
TH13. Climate	State of the climate	Global surface average temperature		X						X			2		X						X			2
	Historical CO_2-emissions	Historic CO_2 emissions							X				1							X				1
	CO_2 emission	Carbon dioxide emissions	X						X		X	X	4	X						X		X	2	5
	CO_2 intensity	CO_2 intensity									X		1									X		1
	GHG emissions	Greenhouse gas emissions	X	X		X	X	X	X	X	X	X	9	X	3		2	X	X	X	2	X	X	13
		Energy-related greenhouse gas emissions																			X			1
	GHG intensity	Greenhouse gas emissions intensity of energy consumption		X					X	X			3		X					X				2
		Greenhouse gas intensity of the economy																		X	X			2
	State of the ozone layer	Ozone concentration								X	X		2								X	X		2
	Ozone depleting emissions	Consumption of ozone depleting substances	X										1	X										1
	Footprint	Carbon footprint of the final national demand				X							1				X							1
	Carbon trade balance	Emission trade balance							X				1							X				1
TH14. Energy resources	Resources	Energy resources							X				1							X				1
	Production	Depletion of energy resources/production							X			X	2							X			X	2
	Supply	Primary energy supply								X			1								X			1
	Consumption	Energy consumption	X	X		X			X		X	X	6	X	2		X			X		X	2	8
		Electricity consumption of households													X									1
		Energy consumption in the residential-service sector															X							1
	Expenditures	Household expenditure on energy used in the home								X			1								X			1
	Intensity/productivity	Energy intensity	X	X		X	X	X	X	X	X		8	X	X		X			X	X	X		6
		Energy productivity																X	X					2
	Renewable energy	Share of renewable energy	X	X		X	X		X	X	X	X	8	X	X		X	X		X		X		6
		Share of renewable electricity													X						X		X	3
	Heat/Power	Combined heat and power generation		X									1		X									1
	Tax	Implicit tax rate on energy		X									1		X									1
	Imports	Imports of energy							X				1							X				1
		Imports of energy from LDCs																		X				1
	Energy dependence	Energy dependence	X	X						X	X	X	5		X						X	X		3
	Distribution	Households living in fuel poverty containing pensioners	X									X	2										X	1
		Households living in fuel poverty containing children																					X	1
		Households living in fuel poverty containing disabled/long-term																					X	1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		sick																						
		Share of households without electricity or other modern energy services												X										1
		Percentage of population using solid fuels for cooking												X										1
TH15. Non-energy resources	Resources	Non-energy resources																						
	Extraction	Extraction																						
	Consumption	Domestic material consumption	X	X		X					X	X	5	X	2		X						X	5
		Total material requirement																				X		1
	Intensity/Productivity	Material intensity of economy	X	X		X	X				X		5	X								X		2
		Resource productivity													X		X	X						3
	Waste	Municipal waste generation	X	X		X					X	X	5		X							X		2
		Non-mineral waste generation													X									1
		Generation of waste												X			X							2
		Waste treatment and disposal												X										1
		Household waste																					X	1
	Hazardous waste	Generation of hazardous waste	X	X		X							3	X	X									2
		Management of radioactive waste												X										1
		Nuclear waste															X							1
	Landfill	Total waste om all sectors disposed of in landfill sites								X		X	2										X	1
		Solid waste disposed of to landfill																			X			1
	Recycling	Waste recycling rate				X				X	X	X	4				X					X		2
		Proportion of population with access to kerbside recycling																			X			1
		Proportion of packaging waste recycled																			X			1
		Household waste recycled or composted																					X	1
	Imports	Material requirement abroad for imports to Switzerland							X		X		2									X		1
		Imports of minerals																		X				1
		Imports of biomass																		X				1
		Imports of minerals from LDCs																		X				1
		Imports of biomass from LDCs																		X				1
TH16. Trust	Generalised trust	Generalised trust							X				1							X				1
	Bridging social	Feelings of discrimination							X				1							X				1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	capital	Opinions about immigrants																		X				1
	Family/Friends	Contact with friends/family							X				1							X				1
		Satisfaction with family life																		X				1
	Voluntary work	Voluntary work				X			X		X	X	4							X		X	X	3
		Participation in associative life															X							1
	Culture	Own cultural activities									X		1									X		1
		Participation in cultural activities																				X		1
	Language	Children attending Māori language immersion schools								X	X		2								X			1
		Speakers of te reo Māori																			X			1
		Local content on New Zealand television																			X			1
		Regular use of a second national language																				X		1
	Monuments	Number of historic places						X		X			2								X			1
		Trend in standard of maintenance of protected buildings																	X					1
TH17. Institutions	Voter turnout	Voter turnout in elections		X		X			X	X			4		X		X			X	X			4
	Trust in institutions	Level of citizens confidence in EU institutions		X					X	X			3		X									1
		Trust in government institutions																		X	X			2
	Corruption	Percentage of population having paid bribes	X										1	X										1
	International institutions	Multilateral treaties									X		1									X		1
	Law	New infringement cases		X									1		X									1
		Transposition of Community law, by policy area													X									1
	E-government	E-government on-line availability		X									1		X									1
		E-government usage by individuals													X									1
	Social justice	Social justice										X	1										X	1
	Distribution-services	Access to key services										X	1										X	1
	Distribution-Institutions-Gender	Women in the national council								X	X		2								X	X		2
TH18. Physical capital	Capital stock	Capital stock							X	X			2							X	X			2
	Investment	Gross fixed capital formation	X	X			X		X	X	X	X	7	X	X			X		X	X	X	X	7
		Social investments																					X	1
	ICT	ICT expenditures	X						X				2							X				1
		Internet users												X										1
		Mobile cellular telephone												X										1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
		Fixed telephone lines												X										1
	Distribution-income	Internet use by income group									X		1										X		1
	Infrastructure	Real net stock of infrastructure per person								X			1									X			1
	Export	Exports of physical capital																							
TH19. Knowledge capital	Capital stock	R&D capital stock							X				1								X				1
	Investment	Total R&D expenditures	X						X	X	X		4	X	X		X	X	X	X	2	X		9
	Innovation	Turnover from innovation		X						X			2		X									1
		Rate of innovation by type																			X			1
	Patents	Patent applications							X		X		2							X		X		2
	Scientific articles	Scientific articles							X				1							X				1
	R&D personnel	Personnel involved in research and development							X	X	X		3							X	X			2
		Human resources in science and technology																				X		1
	Knowledge spillovers	Knowledge networks							X				1							X				1
TH20. Financial capital	Net assets/liabilities	Net foreign assets/liabilities							X				1							X				1
	Debt	Debt to GNI ratio	X	X		X			X	X	X		7	X								X		2
		General government debt													X		X			X	X			4
		Indebtedness of businesses and households															X							1
		Public sector finances as a share of GDP																	X					1
		Ratio of bt services to export earnings																			X			1
	Deficit/Surplus	Current account deficit as percentage of GDP	X				X						2	X				X						2
	FDI	Foreign direct investment in developing countries, by income group	X	X							X		3	X	X							X		3
	Taxes	Public sector fiscal revenue rate									X		1									X		1
	Pensions	Pension reserves		X					X			X	3							X				1
		Pension expenditure													X									1
		Proportion of working age people contributing to a non-state pension in at least three years out of the last four																					X	1
Monetised aggregates	Economic capital	Produced capital (WB)									X		1			X								1
	Financial capital	Financial capital (WB)									X		1			X								1
	Natural capital	Natural capital (WB)									X		1			X								1
	Human capital	Human capital (WB)									X		1			X								1

Theme	Sub-theme	Indicator	Total per sub-theme											Total per indicator										
			UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total	UNCSD	Eurostat	WB	FRA	DEU	NOR	NLD	NZL	CHE	GBR	Total
	Intangible capital	Intangible capital (WB)									X		1			X								1
	Total capital	Comprehensive wealth (WB)									X		1			X								1

ANNEX VI. INDICATOR SELECTION

416. The TFSD proposes three indicator sets: two large sets of 60 and 90 indicators, respectively; and one small set of 25 indicators. In total, 94 unique indicators are used in one or more of the indicator sets proposed by the task force. See Annex VII for more details about the relationship between the three sets and about the indicators included in each set.

417. This annex provides details on the procedure used for selecting indicators in this report. The approach is different for the two large sets on the one hand and the small set on the other hand. The discussion starts with the former.

Selection procedure for the two large sets

418. The broad lines of the selection process were explained in Chapter 7. The indicators of the large sets are selected using three criteria: "Ideal indicators", "Commonalities" and "Data availability". The three criteria were applied in a hierarchy order, with the criterion of "ideal indicators" being the most important and that for commonalities being the second priority.

419. Table VI.1 shows how each indicator scores for each criterion. The "commonalities" column is based on the evidence gathered in Annex V, which provides a detailed analysis of the most common sub-themes in the SDI sets of the institutes that are a member of the TFSD. As a general rule, the most common sub-themes have been chosen for the TFSD indicator set. To identify what is "most common", a specific criterion was applied for each theme, because these differ significantly in terms of how often they occur and how many sub-themes they include.

420. In first instance the most common sub-themes are identified. These are denoted by a "X" in the column "commonalities" of Table VII.1. In some cases, an exception is applied: some sub-themes are included even though they are rarely present in the SDI sets reviewed. Quite often, a theoretical reason was invoked by the TF in order to include them. In other cases, sub-themes which are quite common in the SDI sets, were excluded. The reasoning which is used for each theme is provided below.

421. Note that there is a small difference in the selection procedure for the two large sets: in the case of the conceptual categorisation, only "core indicators" are selected, while in the case of the thematic categorisation both "core" and "policy levers" indicators may be included (see Section 7.4 and Annex 4). The selection procedure used for the large set based on the thematic categorisation is further described below.

422. Subjective well-being
- Criterion. No criterion since there is only one sub-theme.

423. Consumption and income
- Criterion. Sub-themes that are used by at least six of the ten institutes.
- Exception. The Stiglitz-Sen-Fitoussi report recommended the use of consumption and income indicators. The sub-theme for "Consumption" has therefore been included despite the fact that only few countries include this indicator in their sets.

424. Nutrition
- Criterion. No criterion since there is only one sub-theme.

425. Health
- Criterion. Sub-themes that are used by at least four of the ten institutes.
- Exception. The sub-themes on "Expenditures" is included because investment in health it is an important policy lever. The sub-theme "Distribution" is also included because the distribution of health outcomes is an important aspect of inequality.

426. Labour

- Criterion. Sub-themes that are used by at least three of the ten institutes.
- Exception. The sub-theme "Hours worked" is included because it is important for both economic production and to provide insights into people's work-life balance. Conversely, the sub-theme "Unemployment" is excluded, despite being used in many SDI sets, as it largely overlap with the sub-theme on "employment rate".

427. Education
    - Criterion. Sub-themes that are used by at least two of the ten institutes.
    - Exception. The sub-theme "Distribution" is included because the distribution of education is an important aspect of inequality. Conversely, the sub-theme "Subjective" has been excluded. See "Housing" theme for the explanation.
428. Housing
    - Criterion. Sub-themes that are used by at least two of the ten institutes.
    - Exception. The sub-theme "Distribution" is also included because the distribution of housing is an important aspect of inequality. Also, although the sub-theme "Subjective" includes interesting information, it has been excluded by the TF (see the section on "future research" for an explanation of how the system might benefit from an expansion towards subjective indicators).
429. Leisure time
    - Criterion. There are only two subthemes for leisure.
    - Exception. The sub-theme "Subjective" has been excluded. See "Housing" theme for the explanation.
430. Physical safety
    - Criterion. Sub-themes that are used by at least eight of the ten institutes.
    - Exception). The sub-theme "Expenditures on physical safety" is included because investment in public safety is an important policy lever.
431. Land and ecosystems
    - Criterion. Sub-themes that are used by at least five of the ten institutes.
    - Exception. For conceptual reasons, sub-themes on "Land", "Emissions to soil", "Footprint" and "Threatened species" are included. Conversely, the TF excluded the sub-themes on "Land use", because its interpretation is often problematic, and "Fish/Coral", because this topic is very country-specific.
432. Water
    - Criterion. Sub-themes that are used by at least three of the ten institutes.
    - Exception. For conceptual reasons, sub-themes for "Water resources", "Emission to water" and "Footprint" are included.
433. Air quality
    - Criterion. Sub-themes that are used by at least two of the ten institutes.
    - Exception. The sub-theme "Ozone emissions" is included because it an important policy lever. Conversely, the sub-theme on "General air pollution" has been excluded because related indicators are already covered under the theme "air pollution". Similarly, the sub-theme "Noise" was excluded because it was deemed to be a local, rather than a national topic.
434. Climate
    - Criterion. Sub-themes that are used by at least two of the ten institutes.
    - Exception. For conceptual reasons, the sub-themes "Historical emissions" and "Ozone depleting emissions" are included although they are uncommon among the sets reviewed. Conversely, the sub-theme "CO_2 emissions" was excluded because the issues are adequately covered by the "Greenhouse gas emissions" subtheme.
435. Energy resources
    - Criterion. Sub-themes that are used by at least five of the ten institutes.

- Exception. Sub-themes For conceptual reasons, sub-themes on "Resources" and "Imports" are included.

436. Non-Energy resources
   - Criterion. Sub-themes that are used by at least four of the ten institutes.
   - Exception. For conceptual reasons, sub-themes on "Resources" and "Imports" are included.

437. Trust
   - Criterion. Sub-themes that are used by at least four of the ten institutes.
   - Exception. For conceptual reasons, sub-themes on "Generalised trust", "Bridging social capital" and "Friends/Family" are included although they are not common in SDI sets reviewed.

438. Institutions
   - Criterion. Sub-themes that are used by at least two of the ten institutes.

439. Physical capital
   - Criterion. Sub-themes that are used by at least eight of the ten institutes.
   - Exception. For conceptual reasons sub-themes on "Capital stock" and "Export" are included.

440. Knowledge capital
   - Criterion. Sub-themes that are used by at least four of the ten institutes.
   - Exception. For conceptual reasons, sub-theme on "Capital stock" and on "Knowledge spillovers" are included despite being relative uncommon among the sets reviewed.

441. Financial capital
   - Criterion. Sub-themes that are used by at least three of the ten institutes.
   - Exception. For conceptual reasons, a sub-theme on "Net assets/liabilities" is included.

Selection procedure for the small set

442. The 24 indicators of the small set are derived from the 90 indicators included in the large set based on the thematic categorisation. The criteria used for the selection were the following. Firstly, for each of the 20 themes, one indicator is chosen for the national /average. In 12 cases, the selected indicator was the most commonly used sub-theme in the SDI sets reviewed. In three cases, the most common indicator was used (energy resources, non-energy resources and water). In four cases, conceptual considerations or data availability took priority over the criterion "most commonly used". These four sub-themes/indicators are:

- *Consumption and income*. The Stiglitz-Sen-Fitoussi report recommended the use of household consumption and income indicators instead of Gross Domestic Product. Therefore the indicator for final consumption expenditure was preferred above the more commonly used GDP.
- *Health status*. Indicators for suicides, death rates and nutrition/obesity are commonly used in the SDI sets reviewed. Despite this, preference was given to the life expectancy data because the indicator is widely available and better suited for international comparisons.
- *Education*. While sub-themes "basic competencies", "participation in education" and "life-long learning" are more commonly used in the SDI sets reviewed, Educational attainment" is more widely available and a better indicator of the overall level of education in the population.
- *Trust*. Although "voluntary work" is common among the SDI sets reviewed, preference was given to the sub-theme "generalised trust" because it conceptually more suitable for the measurement of social capital.

443. In addition to these 20 indicators, the two most common indicators for the transboundary impacts (ODA, imports from developing countries) and the two most common indicators about distribution (income inequality and gender pay gap) are added to the small set to bring the total up to 24 indicators. They are shown with a light green background in Table VI.1.

Table VI.1. The 94 unique indicators proposed by the TFSD and their scores on "Ideal indicators", "Commonalities" and "Data availability"

Theme	Sub-theme	Indicator	Ideal indicators	Common subtheme/ indicator	Data availibiity	
					Official	Other
Subjective Well-being	Life satisfaction	Life satisfaction	X	X		X
Consumption and income	Consumption	Final consumption expenditure	X		X	
	Gross Domestic Product	GDP per capita	X	X	X	
	Productivity	Labour productivity	X	X	X	
	Official Development Assistance	Official Development Assistance (ODA)	X	X	X	
	Imports from developing countries	Imports from developing countries	X	X	X	
	Distribution-Income-Total	Income inequality	X	X	X	
	Distribution-Income-Gender	Gender pay gap	X	X	X	
Nutrition	Obesity	Obesity prevalence	X	X	X	
Health	Life expectancy	Life expectancy at birth	X	X	X	
	Healthy life expectancy	Healthy life expectancy at birth	X	X	X	
	Mental health	Suicide death rate	X	X	X	
	Health expenditures	Health expenditures	X		X	
	Smoking	Smoking prevalence	X	X	X	
	Distribution-Health	Distribution-health	X			
Labour	Employment rate	Employment rate	X	X	X	
	Hours worked	Hours worked	X		X	
	Retirement	Average exit age from labour market	X	X	X	
	Distribution-Labour-Gender	Female employment rate	X	X	X	
	Distribution-Labour-Age	Youth employment rate	X	X	X	
	Migration	Migration of human capital	X			
Education	Educational attainment	Educational attainment	X	X	X	
	Basic competencies	Expenditures on education	X	X	X	
	Education expenditures	Competencies	X	X	X	
	Participation in education	Early school leavers	X	X	X	
	Life long learning	Lifelong learning	X	X	X	
	Distribution-Education	Distribution-education	X			
Housing	Housing stock	Housing stock	X	X		
	Investments in housing	Investment in housing	X	X		
	Quality of housing	Living without housing deprivation	X	X	X	
	Housing affordability	Affordability	X	X		

Leisure	Time use	Leisure time	X	X	X	
Physical safety	Crime	Death by assault/homicide rate	X	X	X	
	Safety expenditures	Expenditures on safety	X			
Land and ecosystems	Land	Land assets	X			
	Protected areas	Protected areas	X	X	X	
	Soil quality	Nutrient balance	X	X	X	
	Emissions to soil	Emissions to soil	X			
	Species/Ecosystems	Bird index	X	X	X	
	Threatened species	Threatened species	X		X	
	Footprint	Land footprint (foreign part)	X			
Water	Resources	Water resources	X		X	
	Abstraction	Water abstractions	X	X	X	
	Water quality	Water quality index	X	X		
	Emissions to water	Emissions to water	X			
	Footprint	Water Footprint (foreign part)	X			
Air quality	PM concentration	Urban exposure to particulate matter	X	X	X	
	PM emissions	Emissions of particulate matter	X	X	X	
	Ozone concentration	Urban exposure to ozone	X	X	X	
	Ozone emissions	Emissions of tropospheric ozone	X			
	Acidifying emissions	Emission of acidifying substances	X	X	X	
Climate	State of the climate	Global CO2 concentration	X	X		X
	Historical CO_2-emissions	Historic CO2 emissions	X			
	GHG emissions	GHG-Emissions	X	X	X	
	GHG intensity	GHG-Emissions Intensity	X	X		
	Footprint	Carbon footprint (foreign part)	X	X		
	State of the ozone layer	State of the ozone layer	X	X		X
	Ozone depleting emissions	CFC emissions	X		X	
Energy resources	Resources	Energy resources	X			
	Consumption	Consumption	X	X	X	
	Intensity/Productivity	Energy intensity	X	X	X	
	Renewable energy	Renewable energy	X	X	X	
	Imports	Import of energy resources	X		X	
	Energy dependence	Energy dependence	X	X	X	
Non-energy resources	Resources	Non-energy resources	X			
	Consumption	Domestic material consumption	X	X	X	

	Intensity/Productivity	Resource productivity	X	X	X	
	Waste	Generation of waste	X	X	X	
	Recycling	Recycling rate	X	X	X	
	Imports	Import of non-energy resources	X		X	
Trust	Generalised trust	Generalised trust	X			X
	Bridging social capital	Bridging social capital	X			
	Family/Friends	Contact with family and friends	X			X
	Voluntary work	Participation in voluntary work	X	X		X
Institutions	Voter turnout	Voter turnout	X	X	X	
	Trust in institutions	Trust in institutions	X	X	X	
	Distribution-Institutions-Gender	Percentage of women in parliament	X	X	X	
	Global social capital	Contribution to international institutions	X			
Physical Capital	Capital stock	Capital stock	X		X	
	Investment	Gross capital formation	X	X	X	
	Exports	Export of physical capital	X		X	
Knowledge Capital	Capital stock	Capital stock	X			
	R&D expenditures	R&D expenditures	X	X	X	
	Knowledge spillovers	Knowledge spillovers	X		X	
	Exports	Export of knowledge capital	X			
Financial capital	Net assets/liabilities	Assets minus liabilities	X		X	
	Government debt	Government debt	X	X	X	
	Deficit/Surplus	Current deficit/surplus	X	X	X	
	Pensions	Pension reserves	X	X	X	
	Foreign direct investment	Foreign direct investment (FDI)	X		X	
Monetary aggregates	Economic and financial capital	*Place holder*	X	X		X
	Natural capital	*Place holder*	X	X		X
	Human capital	*Place holder*	X	X		X
	Social capital	*Place holder*	X	X		

ANNEX VII. RELATIONSHIP BETWEEN THE THREE TFSD INDICATOR SETS

444. Overall, this report proposes three indicators sets:

(a) A large set based on the conceptual categorisation (60 indicators)
(b) A large set based on the thematic categorisation (90 indicators)
(c) A small set also based on the thematic categorisation (24 indicators)

445. In total, this report suggests 94 indicators, which are used in one or more of the indicator sets. Table VII.1 shows the relationship between these indicators and the three indicator sets.

446. In summary, the large set based on the conceptual categorisation includes 22 indicators for the 'here and now', 26 for 'later' and 12 for the 'elsewhere' dimensions. It should be noted, however, that some of these indicators occur twice in the set. For example, "educational attainment" is an indicator for both the 'here and now' and also for the 'later' dimension. The number of unique indicators is therefore 48.

Table VII.1 The use of the 94 indicators in the three TFSD indicator sets

Theme	Sub-theme	Indicator	Large set					Large set	Small set
			Conceptual categorisation					Thematic categorisation	Thematic categorisation
			Here and now	Later	Elsewhere	Total	Unique		
Subjective Well-being	Life satisfaction	Life satisfaction	1			1	1	1	1
Consumption and income	Consumption	Final consumption expenditure	1			1	1	1	1
	Gross Domestic Product	GDP per capita						1	
	Productivity	Labour productivity						1	
	Official Development Assistance	Official Development Assistance (ODA)			1	1	1	1	1
	Imports from developing countries	Imports from developing countries			1	1	1	1	1
	Distribution-Income-Total	Income inequality	1			1	1	1	1
	Distribution-Income-Gender	Gender pay gap	1			1	1	1	
Nutrition	Obesity	Obesity prevalence	1			1	1	1	
Health	Life expectancy	Life expectancy at birth	1	1		2	1	1	1
	Healthy life expectancy	Healthy life expectancy at birth						1	
	Mental health	Suicide death rate						1	
	Health expenditures	Health expenditures						1	
	Smoking	Smoking prevalence						1	
	Distribution-Health	Distribution-health	1	1		2	1	1	
Labour	Employment rate	Employment rate	1	1		2	1	1	1
	Hours worked	Hours worked						1	
	Retirement	Average exit age from labour market						1	
	Distribution-Labour-Gender	Female employment rate	1	1		2	1	1	
	Distribution-Labour-Age	Youth employment rate	1	1		2	1	1	
	Migration	Migration of human capital			1	1	1	1	
Education	Educational attainment	Educational attainment	1	1		2	1	1	1
	Basic competencies	Expenditures on education						1	
	Education expenditures	Competencies						1	
	Participation in education	Early school leavers						1	
	Life long learning	Lifelong learning						1	
	Distribution-Education	Distribution-education	1	1		2	1	1	
Housing	Housing stock	Housing stock						1	
	Investments in housing	Investment in housing						1	
	Quality of housing	Living without housing deprivation	1			1	1	1	1

	Housing affordability	Affordability						1	
Leisure	Time use	Leisure time	1			1	1	1	1
Physical safety	Crime	Death by assault/homicide rate	1			1	1	1	1
	Safety expenditures	Expenditures on safety						1	
Land and ecosystems	Land	Land assets		1		1	1	1	
	Protected areas	Protected areas						1	
	Soil quality	Nutrient balance						1	
	Emissions to soil	Emissions to soil						1	
	Species/Ecosystems	Bird index	1	1		2	1	1	1
	Threatened species	Threatened species						1	
	Footprint	Land footprint (foreign part)			1	1	1	1	
Water	Resources	Water resources		1		1	1	1	
	Abstraction	Water abstractions						1	1
	Water quality	Water quality index	1			1	1	1	
	Emissions to water	Emissions to water						1	
	Footprint	Water Footprint (foreign part)			1	1	1	1	
Air quality	PM concentration	Urban exposure to particulate matter	1	1		2	1	1	1
	PM emissions	Emissions of particulate matter						1	
	Ozone concentration	Urban exposure to ozone						1	
	Ozone emissions	Emissions of tropospheric ozone						1	
	Acidifying emissions	Emission of acidifying substances						1	
Climate	State of the climate	Global CO2 concentration		1		1	1	1	
	Historical CO2-emissions	Historic CO2 emissions						1	
	GHG emissions	GHG-Emissions						1	1
	GHG intensity	GHG-Emissions Intensity						1	
	Footprint	Carbon footprint (foreign part)			1	1	1	1	
	State of the ozone layer	State of the ozone layer		1		1	1	1	
	Ozone depleting emissions	CFC emissions						1	
Energy resources	Resources	Energy resources		1		1	1	1	
	Consumption	Consumption						1	1
	Intensity/Productivity	Energy intensity						1	
	Renewable energy	Renewable energy						1	1
	Imports	Import of energy resources			1	1	1	1	
	Energy dependence	Energy dependence						1	1
Non-energy resources	Resources	Non-energy resources		1		1	1	1	

	Consumption	Domestic material consumption						1	1
	Intensity/Productivity	Resource productivity						1	
	Waste	Generation of waste						1	
	Recycling	Recycling rate						1	
	Imports	Import of non-energy resources			1	1	1	1	
Trust	Generalised trust	Generalised trust	1	1		2	1	1	1
	Bridging social capital	Bridging social capital	1			1	1	1	
	Family/Friends	Contact with family and friends						1	
	Voluntary work	Participation in voluntary work		1		1	1	1	
Institutions	Voter turnout	Voter turnout	1	1		2	1	1	1
	Trust in institutions	Trust in institutions						1	
	Distribution-Institutions-Gender	Percentage of women in parliament	1	1		2	1	1	
	Global social capital	Contribution to international institutions			1	1	1	1	
Physical Capital	Capital stock	Capital stock		1		1	1	1	
	Investment	Gross capital formation						1	1
	Exports	Export of physical capital			1	1	1	1	
Knowledge Capital	Capital stock	Capital stock		1		1	1	1	
	R&D expenditures	R&D expenditures						1	1
	Knowledge spillovers	Knowledge spillovers						1	
	Exports	Export of knowledge capital			1	1	1	1	
Financial capital	Net assets/liabilities	Assets minus liabilities		1		1	1	1	
	Government debt	Government debt						1	1
	Deficit/Surplus	Current deficit/surplus						1	
	Pensions	Pension reserves			1	1	1	1	
	Foreign direct investment	Foreign direct investment (FDI)						1	
Monetary aggregates	Economic and financial capital	Place holder		1		1	1		
	Natural capital	Place holder		1		1	1		
	Human capital	Place holder		1		1	1		
	Social capital	Place holder		1		1	1		
			22	26	12	60	48	90	24

ANNEX VIII. DATA AVAILABILITY FOR 46 COUNTRIES

447. This Annex assesses the data availability of the indicators included in the three sets proposed in this report

448. In total, there are 94 unique indicators that are used in one or more the three indicator sets (see Annex VII).

449. Table VIII.1 summarises information on the availability of these 94 indicators across 46 countries. The countries considered are members of the European Union and/or the OECD and the six so-called BRIICS countries (Brazil, Russia, India, Indonesia, China, and South Africa). The analysis covers the statistical databases of the UN, the OECD and Eurostat. For those indicators that were not present in any of these databases, the European Social Survey was also considered. The analysis was performed over the period February 2012 - April 2012.

450. For these 46 countries, Table VIII.1 counts the numbers of data points available since 2000; for example, a "11" in Table VIII.1 indicates that annual data for this indicator are available in one of the databases for all years 2000-2010.[39]

[39] It should be noted that the indicator "GHG emissions intensity" was not found in the UN, OECD and Eurostat databases. However, it was considered as available because it can be calculated based on GHG emissions and GDP data that are both available in the analysed databases.

Table VIII.1 Data availability in the UN, OECD and Eurostat databases for the 94 TFSD indicators for 46 countries

Theme	Sub-theme	Indicator	Australia				Austria				Belgium				Brazil				Bulgaria				Canada				Chile				China				Cyprus				Czech Rep.				Denmark				Estonia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
Subjective Well-being	Life satisfaction	Life satisfaction								3				4								2																2				3				4				3
Consumption and income	Consumption	Final consumption expenditure	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11				11		11		11	11	11		11	11	11		11	11	11	
	Gross Domestic Product	GDP per capita	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11	11			11		11		11	11	11		11	11	11		11	11	11	
	Productivity	Labour productivity		11				11	11			11	10								11			11				11									11					11	11			11	11		
	Official Development Assistance	Official Development Assistance	11	11			11	11	7		11	11	7								5		11	11													7					7			11	11	7				7	
	Imports from developing countries	Imports from developing countries	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11				11		11		11	11	11		11	11	11		11	11	11	
	Distribution-Income-Total	Income inequality		2				2	10			2	10								11			2				1									6				2	7				2	9			1	11	
	Distribution-Income-Gender	Gender pay gap		9				9	3			7	2								3			9													3				9	3				9	3				1	
Nutrition	Obesity	Obesity prevalence		3				1	1		1	3	1		1						1		1	6			1	1				4			1		1		1	2	1		1	11			1	5	1	
Health	Life expectancy	Life expectancy at birth	2	10			2	10	10		2	10	10		2				2		10		2	8			2	11				10			2		10		2	10	10		2	10	10		2	10	10	
	Healthy life expectancy	Healthy life expectancy at birth	1				1		10		1		10		1				1		3		1				1								1		6		1		6		1		10		1		6	
	Mental health	Suicide death rate		6				10	10			2	2								10			5				8									6				10	10			7	10			10	10	
	Health expenditures	Health expenditures	7	5			7	6	5		7	6	6		7				7		2		7	6			7								7		5		7	6	6		7	6	6		7		6	
	Smoking	Smoking prevalence	1	1			1		1		1		1						1		1		1	3			1	2									1				1	1	1		1		1		1		1	
	Distribution-Health	Distribution-health																																																
Labour	Employment rate	Employment rate	10	11			10	11	11		10	10	11		9				10		11		10	11			10								10		11		10	11	11		10	11	11		10	11	11	
	Hours worked	Hours worked	9	11			10	11	9			11	9		7				9		9		10	11			10	11							8		9			11	9			10	9		10	11	9	
	Retirement	Average exit age from labour market							6				6								5																6				9						9				9	
	Distribution-Labour-Gender	Female employment rate	7	11			7	11			7	11			7				7				7	11			7	11							7				7	11			7	11			7	11		
	Distribution-Labour-Age	Youth employment rate							11				11								11																11					11					11				11	
	Migration	Migration of human capital																																																
Education	Educational attainment	Educational attainment	10	6			10	6	7		10	6	11		9				10		11		2	6			9								10		11		10	6	11		10	6	11		10		11	
	Basic competencies	Expenditures on education	9	3			9	3	9		8	3	8		8				8		9		6	3			9								9		9		9	3	9		9	3	9		8		9	
	Education	Competencies		9				9				9			2				1					7			1	9							1					9				9			1	5		

Theme	Sub-theme	Indicator	Australia				Austria				Belgium				Brazil				Bulgaria				Canada				Chile				China				Cyprus				Czech Rep.				Denmark				Estonia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	expenditures																																																
	Participation in education	Early school leavers					7		11		4		11		4				9		10						2								7		11		9		9		3		11		9		11	
	Life long learning	Lifelong learning							8				8								8																8				8				8				8	
	Distribution-Education	Distribution-education																																															
Housing	Housing stock	Housing stock																																															
	Investments in housing	Investment in housing																																															
	Quality of housing	Living without housing deprivation							7				7								5																5				5				7				6	
	Housing affordability	Affordability																																															
Leisure	Time use	Leisure time											1								1																												1	
Physical safety	Crime	Death by assault/homicide rate	6	6			6	10	10		6	2	2		6				6		10		6	5			6	8							6		6		6	10	10		5	7	10		6	10	10	
	Safety expenditures	Expenditures on safety																																															
Land and ecosystems	Land	Land assets																																															
	Protected areas	Protected areas	8				8		8		8		8		8				8		3		8				8								8		6		8		6		8		8		8		6	
	Soil quality	Nutrient balance		1				1	10			1	9								9			1												4			1	10			1	10				6	
	Emissions to soil	Emissions to soil																																															
	Species/Ecosystems	Bird index							9				9																																				7	
	Threatened species	Threatened species		1				1				1												1				1												1				1				1		
	Footprint	Land footprint (foreign part)																																															
Water	Resources	Water resources		1				1			8	1												1				1							10				10	1				1			2	1		
	Abstraction	Water abstractions	2				2				8				1				10																10				10				10				10			
	Water quality	Water quality index																																															
	Emissions to water	Emissions to water																																															
	Footprint	Water Footprint (foreign part)																																															
Air quality	PM concentration	Urban exposure to particulate matter	7				7		10		7		10		7				7		9		7				7								7				7		10		7		8		7		9	
	PM emissions	Emissions of particulate matter						9																				5													8							9		
	Ozone concentration	Urban exposure to ozone							10				10								8																				10					9			9	
	Ozone emissions	Emissions of tropospheric ozone																																															
	Acidifying emissions	Emission of acidifying	6	10			6	10	10		6	10	10						6		10			10				7								10				6	10	10		6	10	10		6	10	10	

Theme	Sub-theme	Indicator	Australia				Austria				Belgium				Brazil				Bulgaria				Canada				Chile				China				Cyprus				Czech Rep.				Denmark				Estonia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
		substances																																															
Climate	State of the climate	Global CO2 concentration																																																
	Historical CO2-emissions	Historic CO2 emissions																																															
	GHG emissions	GHG-Emissions	9	10			9	10	10		9	10	10						9		10		9	10				7								10			9	10	10		9	10	10		9	10	10	
	GHG intensity	GHG-Emissions Intensity																																															
	Footprint	Carbon footprint (foreign part)																																															
	State of the ozone layer	State of the ozone layer																																															
	Ozone depleting emissions	CFC emissions	7												7								7				7																						
Energy resources	Resources	Energy reserves																																															
	Consumption	Consumption	8	11			8	11	11		8	11	11		8				8		11		8	11			8	11				10			8		11		8	11	11		8	11	11		8	11	11	
	Intensity/Productivity	Energy intensity	6				6		10		6		10		6				6		10		6				6								6		10		6		10		6		10		6		10	
	Renewable energy	Renewable energy	6	11			6	11	4		6	11	4		6				6		4		6	11			6	11				10			6		4		6	11	4		6	11	4		6	11	4	
	Imports	Import of energy resources	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11				11		11		11	11	11		11	11	11		11	11	11	
	Energy dependence	Energy dependence							10				10								10																10						10				10		
Non-energy resources	Resources	Non-energy reserves																																															
	Consumption	Domestic material consumption		6				6	8			6	8								8			6												8				6	8				6	8				8	
	Intensity/Productivity	Resource productivity		6				6	8			6	8								8			6												8				6	8				6	8				8	
	Waste	Generation of waste	2	1			10	10	3		10	11	3		7				10		3		2				10	10				10			10		3		10	11	3		10	11	3		10	11	3	
	Recycling	Recycling rate							10				10								5																6						10				6		
	Imports	Import of non-energy resources	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11				11		11		11	11	11		11	11	11		11	11	11	
Trust	Generalised trust	Generalised trust								3				4								2																2				3				4				3
	Bridging social capital	Bridging social capital																																															
	Family/Friends	Contact with family and friends								3				4								2																2				3				4				3
	Voluntary work	Participation in voluntary work								3				4								2																2				3				4				3
Institutions	Voter turnout	Voter turnout							2				2								2																1				3				2				1	
	Trust in institutions	Trust in institutions							5				5								5																5				5				5				5	
	Distribution-Institutions-Gender	Percentage of women in parliament	11				11				11				11				11				11				11								11				11				11				11			

Theme	Sub-theme	Indicator	Australia				Austria				Belgium				Brazil				Bulgaria				Canada				Chile				China				Cyprus				Czech Rep.				Denmark				Estonia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	Global social capital	Contribution to international institutions																																														
Physical Capital	Capital stock	Capital stock		9				8				10												10				9																				
	Investment	Gross capital formation	9				10		11		10		11		11				11				10				11								9		11		10		11		10		10		11		9	
	Exports	Export of physical capital	11	11			11	11	11		11	11	11		11				11		11		11	11			11	11			11				11		11		11	11	11		11	11	11		11	11	11	
Knowledge Capital	Capital stock	Capital stock																																														
	R&D expenditures	R&D expenditures	4	5			9	11	11		8	11	11		7				8		11		8	11			5	2				10			8		11		8	11	11		8	10	11		8	11	11	
	Knowledge spillovers	Knowledge spillovers							1				1								1																1				1						1	
	Exports	Export of knowledge capital																																														
Financial capital	Net assets/liabilities	Assets minus liabilities		11				11	11			11	11								11															11			8	11			11	11			11	11	
	Government debt	Government debt		11				11	11			11	11								11			11				11							11			11	11			11	11			11	11	
	Deficit/Surplus	Current deficit/surplus	10				10		11		10		11		10				10		11		10				10								3		11		10		11		10		11		10		11	
	Pensions	Pension reserves		4								2												9																								
	Foreign direct investment	Foreign direct investment (FDI)																																														
Monetary aggregates	Economic and financial capital																																															
	Natural capital																																															
	Human capital																																															
	Social capital																																															

Table VIII.1 Data availability in the UN, OECD and Eurostat databases for the 94 TFSD indicators for 46 countries (continued)

Theme	Sub-theme	Indicator	Finland				France				Germany				Greece				Hungary				Iceland				India				Indonesia				Ireland				Israel				Italy				Japan			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
Subjective Well-being	Life satisfaction	Life satisfaction				4				4				4				3				4				1											3				2				1				
Consumption and income	Consumption	Final consumption expenditure	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11				11	11			11	11	11		11	11			11	11	11		11	11	11	
	Gross Domestic Product	GDP per capita	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	6			11	11			11	11	11		11	11			11	11	11		11	11	11	
	Productivity	Labour productivity		11	11			11	11			11	11			11	11			11	11			11												11	11			11				11	11			11			
	Official Development Assistance	Official Development Assistance	11	11	7		11	11	7		11	11	7		11	11	7				7				7												11	11	7						11	11	7		11	11		
	Imports from developing countries	Imports from developing countries	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11			11				11				11	11	11		11	11			11	11	11		11	11		
	Distribution-Income-Total	Income inequality		2	11			2	11			2	8			2	10			2	10			1	7											2	9			2				2	9			2			
	Distribution-Income-Gender	Gender pay gap		9	3			8	2			9	3				1			8	3															7	2							2	2			9			
Nutrition	Obesity	Obesity prevalence	1	10				6	1		1	3	1		1	5	1		1	3	1		1	11			1	1			1	2			1	2				6			1	10			1	11		
Health	Life expectancy	Life expectancy at birth	2	10	10		2	11	10		2	10	10		2	10	10		2	10	10		2	10	10		2	10			2	10			2	10	10		2	10			2	9	9		2	10		
	Healthy life expectancy	Healthy life expectancy at birth	1		10		1		10		1		9		1		10		1		6		1		5		1				1				1		10		1				1		9		1			
	Mental health	Suicide death rate		10	10			9	8			7	10			10	10			10	10			10	10											10	10			9				6	7			10		
	Health expenditures	Health expenditures	7	6	6		7	6	6		7	6	6		7	6			7	6	6		7	6	6		7				7				7	6			7				7	6			7	5	5	
	Smoking	Smoking prevalence	1	1	1		1		1		1		1		1		1		1		1		1		1		1				1				1	1	1		1				1		1		1	10		
	Distribution-Health	Distribution-health																																																
Labour	Employment rate	Employment rate	10	11	11		10	10	11		10	11	11		10	10	11		10	11	11		10	11	8		2				8				10	11	11		9				10	11	11		10	10	11	
	Hours worked	Hours worked	10	11	9		10	10	9			11	9		9	11	9			11	9		10	11	9						5				10	11	9		10	6			10	11	9		4	11		
	Retirement	Average exit age from labour market			8				9				8				7				6				6												6								8						
	Distribution-Labour-Gender	Female employment rate	7	11			7	10			7	11			7	11			7	11			7	11			7				7				7	11			7	11			7	11			7	11		
	Distribution-Labour-Age	Youth employment rate			11				11				11				11				11				8												11								11						
	Migration	Migration of human capital																																																
Education	Educational attainment	Educational attainment	10	6	11		10	6	11			6	11		8	6	11		10	6	11		10	6	11		9				9				10	6	11		10				10	6	11		10	3		
	Basic competencies	Expenditures on education	9	3	9		9	3	9		3	3	9		6	3	6		9	3	9		9	3	9		5				8				9	3	9		9				9	3	9		9	3	9	
	Education	Competencies		9				9				9			1	6				9				9			1	4			1	3				9				9			1	9				9		

Theme	Sub-theme	Indicator	Finland				France				Germany				Greece				Hungary				Iceland				India				Indonesia				Ireland				Israel				Italy				Japan			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	expenditures																																																
	Participation in education	Early school leavers	9		11				11		8		11		3		11		9		11		5		11		3				4						9		7				6		11		1			
	Life long learning	Lifelong learning			8				8				8				8				8				7												8							8						
	Distribution-Education	Distribution-education																																																
Housing	Housing stock	Housing stock																																															
	Investments in housing	Investment in housing																																															
	Quality of housing	Living without housing deprivation			6				6				5				7				5				6												7							6						
	Housing affordability	Affordability																																															
Leisure	Time use	Leisure time			1				1				1																																	1				
Physical safety	Crime	Death by assault/homicide rate	6	10	10		6	9	8		6	7	10		6	10	10		6	10	10		3	9	10		5				2				5	10	10		3	9			5	6	7		6	10		
	Safety expenditures	Expenditures on safety																																															
Land and ecosystems	Land	Land assets																																															
	Protected areas	Protected areas	8		8		8		8		8		8		8		8		8		6		8				8				8				8		8		8				8		8		8			
	Soil quality	Nutrient balance		1	10			1	9			1	9			1	9			1	9			1												1	10						1	9			1		
	Emissions to soil	Emissions to soil																																															
	Species/Ecosystems	Bird index			9				9				9								9																9							8						
	Threatened species	Threatened species		1				1				1				1				1				1												1				1			1				1		
	Footprint	Land footprint (foreign part)																																															
Water	Resources	Water resources	6	1				1			8	1				1			10	1				1												1							1				1		
	Abstraction	Water abstractions	2				8				3				8				2				6								6				2				9							3			
	Water quality	Water quality index																																															
	Emissions to water	Emissions to water																																														
	Footprint	Water Footprint (foreign part)																																															
Air quality	PM concentration	Urban exposure to particulate matter	7		10		7		9		7		10		7		7		7		7		7		6		7				7				7		9		7				7		10		7			
	PM emissions	Emissions of particulate matter										9																								9							9						
	Ozone concentration	Urban exposure to ozone			10				10				10				7				7				3												8							10						
	Ozone emissions	Emissions of tropospheric ozone																																															
	Acidifying emissions	Emission of acidifying	6	10	10		6	10	10		6	10	10		6	10	10		6	10	10		6	10	10										6	10	10		3	8			6	10	10		6	10		

Theme	Sub-theme	Indicator	Finland				France				Germany				Greece				Hungary				Iceland				India				Indonesia				Ireland				Israel				Italy				Japan			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
		substances																																															
Climate	State of the climate	Global CO2 concentration																																																
	Historical CO2-emissions	Historic CO2 emissions																																															
	GHG emissions	GHG-Emissions	9	10	10		9	10	10		9	10	10		9	10	10		9	10	10		9	10	10										9	10	10		4	6			9	10	10		9	10		
	GHG intensity	GHG-Emissions Intensity																																															
	Footprint	Carbon footprint (foreign part)																																															
	State of the ozone layer	State of the ozone layer																																															
	Ozone depleting emissions	CFC emissions																					7				7				7								7								7			
Energy resources	Resources	Energy reserves																																															
	Consumption	Consumption	8	11	11			11	11		8	11	11		8	11	11		8	11	11		8	11			8	10			8	10			8	11	11		8	11				11	11		8	11		
	Intensity/Productivity	Energy intensity	6		10		6		10		6		10		6		10		6		10		6		7		6				6				6		10		6				6		10		6		10	
	Renewable energy	Renewable energy	6	11	4			11	4		6	11	4		6	11	4		6	11	4		6	11			6	10			6	10			6	11	4		6	11				11	4		6	11		
	Imports	Import of energy resources	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11			11				11				11	11	11		11	11			11	11	11		11	11		
	Energy dependence	Energy dependence			10				10				10				10				10				7												10						10						
Non-energy resources	Resources	Non-energy reserves																																															
	Consumption	Domestic material consumption		6	8			6	8			6	8			6	8			6	8			6												6	8					6	8			6			
	Intensity/Productivity	Resource productivity		6	8			6	8			6	8			6	8			6	8			6												6	8					6	8			6			
	Waste	Generation of waste	10	11	3		10	10	3		10	10	3		10	10	3		10	10	3		10	10	1		1	1			9	1			10	10	3		10	11			10	10	3		2	9		
	Recycling	Recycling rate			10				10				10				10				6																10						10						
	Imports	Import of non-energy resources	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11			11				11				11	11	11		11	11			11	11	11		11	11		
Trust	Generalised trust	Generalised trust				4				4				4				3				4				1												3				2				1				
	Bridging social capital	Bridging social capital																																															
	Family/Friends	Contact with family and friends				4				4				4				3				4				1												3				2				1				
	Voluntary work	Participation in voluntary work				4				4				4				3				4				1												3				2				1				
Institutions	Voter turnout	Voter turnout			1				1				2				2				2				2												1						2							
	Trust in institutions	Trust in institutions			5				5				5				5				5																5						5							
	Distribution-Institutions-Gender	Percentage of women in parliament	11				11				11				11				11				11				11				10				11				11				11				11			

Theme	Sub-theme	Indicator	Finland				France				Germany				Greece				Hungary				Iceland				India				Indonesia				Ireland				Israel				Italy				Japan			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	Global social capital	Contribution to international institutions																																															
Physical Capital	Capital stock	Capital stock		10																																		9											
	Investment	Gross capital formation	10		11		10		11		10		11		10		1		9		11		10				11				11				10		9		11				10		11		10			
	Exports	Export of physical capital	11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11			11				11				11	11	11		11	11			11	11	11		11	11		
Knowledge Capital	Capital stock	Capital stock																																															
	R&D expenditures	R&D expenditures	9	11	11		8	11	11		8	11	11		5	6	6		8	11	11		6	8	9		6				1				8	11	11		8	11			8	11	11		7	10	9	
	Knowledge spillovers	Knowledge spillovers			1				1				1								1																1								1							
	Exports	Export of knowledge capital																																															
Financial capital	Net assets/liabilities	Assets minus liabilities		11	11			10	11			10	11			11	11			11	11															10				10				11	11					
	Government debt	Government debt		11	11			11	11			11	11			11	11			11	11			11	6									11	11			11				11	11			10		
	Deficit/Surplus	Current deficit/surplus	9		11		10		11		10		11		10		11		10		11		10		6		10				8				10		11		10				10		11					
	Pensions	Pension reserves						1																												9												8		
	Foreign direct investment	Foreign direct investment (FDI)																																															
Monetary aggregates	Economic and financial capital	Place holder																																															
	Natural capital																																																
	Human capital																																																
	Social capital																																																

Table VIII.1 Data availability in the UN, OECD and Eurostat databases for the 94 TFSD indicators for 46 countries (continued)

Theme	Sub-theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				NewZealand				Poland				Romania				Russia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
Subjective Well-being	Life satisfaction	Life satisfaction								1								2												4				4								4				1				2
Consumption and income	Consumption	Final consumption expenditure	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11	11		11	11	11		11	11			11	11	11		11		11		11	10		
	Gross Domestic Product	GDP per capita	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11	11		11	11	11		11	11			11	11	11		11		11		11	11		
	Productivity	Labour productivity		11					11				11			11	9				10			11				11	11			11	11			11				11	11				11			11		
	Official Development Assistance	Official Development Assistance		11					7				7		11	11	7				7						11	11	7		11	11	7		11	11					7				5					
	Imports from developing countries	Imports from developing countries	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11	11		11	11			11	11			11	11	11		11		11		11			
	Distribution-Income-Total	Income inequality		1					7				8			2	10				7			2				2	10			2	11			2				2	8				11					
	Distribution-Income-Gender	Gender pay gap		9					3				3				3				3							7	3				3			9				7	2				3					
Nutrition	Obesity	Obesity prevalence		5			1		1		1					10			1		1		1	2				10			1	11			1	8			1	3	1		1		1			4		
Health	Life expectancy	Life expectancy at birth	2	10			2		8		2		10		2	10	10		2		10		2	11			2	10	10		2	10	10		2	10			2	10	10		2		10		2	10		
	Healthy life expectancy	Healthy life expectancy at birth	1				1		5		1		5		1		6		1		6		1				1		9		1		7		1				1		6		1		3		1			
	Mental health	Suicide death rate		8					10				10			9	10				9			9				10	10			10	10			8				9	10				10				7	
	Health expenditures	Health expenditures	7	6			7		4		7		6		7	5	5		7				7	6			7	6	6		7	6	4		7	6			7	6	6		7		6		7			
	Smoking	Smoking prevalence	1	5			1		1		1		1		1	11			1		1		1	5			1		1		1		1		1	2			1		1		1		1		1			
	Distribution-Health	Distribution-health																																																
Labour	Employment rate	Employment rate		11			10		11		10		11		10	11	11		10		11		11	11			10	10	11		10	11	11		10	11			10	10	11		10		11		9			
	Hours worked	Hours worked		11			10		9		10		9			11	9		10		9		6	11			7	11	9		1	11	9		10	11			9	11	8		9		9		5	11		
	Retirement	Average exit age from labour market							6				4				5				8								9				9								6				5					
	Distribution-Labour-Gender	Female employment rate		11			7				7				7	10			7				7	11			7	11			7	11			7	11			7	11			7				7			
	Distribution-Labour-Age	Youth employment rate							11				11				11				11								11				11								11				11					
	Migration	Migration of human capital																																																
Education	Educational attainment	Educational attainment	10	6			10		11		10		11		5	6	11		9		11		10	6			10	6	11		10	6	11		10	6			10	6	11		10		11		7			
	Basic competencies	Expenditures on education	8	3			8		9		8		9		1	3	7		4		9		9	3			9	2	9		9	3	9		8	3			9	3	9		7		7		8			
	Education	Competencies		9			1				1					8							4	9				9				9				9				9			1				1	9		

Theme	Sub-theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				NewZealand				Poland				Romania				Russia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	expenditures																																																
	Participation in education	Early school leavers	9				9		9		9		11				11		5		11		9				2		11		9		11						8		10		9		11		4			
	Life long learning	Lifelong learning							8				8				8				8								8				7								8						8					
	Distribution-Education	Distribution-education																																																
Housing	Housing stock	Housing stock																																																
	Investments in housing	Investment in housing																																																
	Quality of housing	Living without housing deprivation							5				5				7				5								5				6								5				3					
	Housing affordability	Affordability																																																
Leisure	Time use	Leisure time							1				1																				1								1									
Physical safety	Crime	Death by assault/homicide rate	6	8			6		10		6		10		6	9	10		4		9		6	9			5	10	10		5	10	10		5	8			6	9	10		6		10		6	7		
	Safety expenditures	Expenditures on safety																																															
Land and ecosystems	Land	Land assets																																																
	Protected areas	Protected areas					8		6		8		6		8		8		8		6		8				8		8		8				8				8		6		8		3		8			
	Soil quality	Nutrient balance		1					9				9			1	9				7			1				1	9			1	10			1				1	10				9					
	Emissions to soil	Emissions to soil																																																
	Species/Ecosystems	Bird index							9																				9				9								9									
	Threatened species	Threatened species		1												1								1				1				1				1				1						1			
	Footprint	Land footprint (foreign part)																																															
Water	Resources	Water resources		1			8				6					1			10					1			8	1			10	1			10	1			10					1				
	Abstraction	Water abstractions					8				8				1				10				4				5				1				2				10				10				10			
	Water quality	Water quality index																																																
	Emissions to water	Emissions to water																																																
	Footprint	Water Footprint (foreign part)																																																
Air quality	PM concentration	Urban exposure to particulate matter	7				7		2		7		6		7		2						7				7		10		7		7		7				7		10		7		7		7			
	PM emissions	Emissions of particulate matter																						1								9								5									
	Ozone concentration	Urban exposure to ozone							6				6																10				2								10				6					
	Ozone emissions	Emissions of tropospheric ozone																																																
	Acidifying emissions	Emission of acidifying		9			6		10		6		10		5	10	10		7		10		1	1			6	10	10		6	10			6	10			6	10	10		6		10		6			

Theme	Sub-theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				NewZealand				Poland				Romania				Russia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
		substances																																															
Climate	State of the climate	Global CO2 concentration																																																
	Historical CO2-emissions	Historic CO2 emissions																																															
	GHG emissions	GHG-Emissions		8			9		10		9		10		9	10	10		9		10		2	5			9	10	10		9	10	10		9	10			9	10	10		9		10		9	10		
	GHG intensity	GHG-Emissions Intensity																																															
	Footprint	Carbon footprint (foreign part)																																															
	State of the ozone layer	State of the ozone layer																																															
	Ozone depleting emissions	CFC emissions																					7								7				7												7			
Energy resources	Resources	Energy reserves																																															
	Consumption	Consumption		11			8		11		8		11		8	11	11		8		11		8	11			8	11	11			11	11		8	11			8	11	11		8		11		8	10		
	Intensity/Productivity	Energy intensity					6		10		6		10		6		10		6		10		6				6		10		6		10		6				6		10		6		10		6			
	Renewable energy	Renewable energy		11			6		4		6		4		6	11	4		6		4		6	11			6	11	4			11	4		6	11			6	11	4		6		4		6	10		
	Imports	Import of energy resources	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11	11		11	11			11	11			11	11	11		11		11		11			
	Energy dependence	Energy dependence							10				10				10				10								10			10									10				10					
Non-energy resources	Resources	Non-energy reserves																																															
	Consumption	Domestic material consumption		6					8				8				8				8			6				6	8			6	8			6				6	8				8					
	Intensity/Productivity	Resource productivity		6					8				8				8				8			6				6	8			6	8			6				6	8				8					
	Waste	Generation of waste		10			10		3		10		3		10	11	3		10		3		3	11			10	11	3		10	11	3			5			10	11	3		10		3		10	11		
	Recycling	Recycling rate							6				6				10				4								10				4								6				5					
	Imports	Import of non-energy resources	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11			11	11			11	11			11	11	11		11		11		11			
Trust	Generalised trust	Generalised trust								1								2												4				4								4				1				2
	Bridging social capital	Bridging social capital																																															
	Family/Friends	Contact with family and friends								1								2												4				4								4				1				2
	Voluntary work	Participation in voluntary work								1								2												4				4								4				1				2
Institutions	Voter turnout	Voter turnout							1				1				1				1								2				2								2				1				
	Trust in institutions	Trust in institutions							5				5				5				5								5												5				5					
	Distribution-Institutions-Gender	Percentage of women in parliament					11				11				11				11				11				11								11								11				11				

Theme	Sub-theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				NewZealand				Poland				Romania				Russia			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	Global social capital	Contribution to international institutions																																														
Physical Capital	Capital stock	Capital stock		10																																												
	Investment	Gross capital formation					11		11		11		11		10		4		10		11		11				10		11		10				11		10		11				11			
	Exports	Export of physical capital	11	11			11		11		11		11		11	11	11		11		11		11	11			11	11	11		11	11			11	11	11		11		11		11			
Knowledge Capital	Capital stock	Capital stock																																													
	R&D expenditures	R&D expenditures	7	11			8		11		8		11		7	9	9		8		9		6	8			8	11	11		8	10	10		3	5			8	11	11		8		11		8	11		
	Knowledge spillovers	Knowledge spillovers							1				1				1				1								1				1							1				1							
	Exports	Export of knowledge capital																																															
Financial capital	Net assets/liabilities	Assets minus liabilities							11				11			5	5				7			10				11	11			11	11							11	11				11					
	Government debt	Government debt		11					11				11			11	11				11			11				11	11			11	10			11				11	11				11					
	Deficit/Surplus	Current deficit/surplus					10		11		10		11		10		11		7		11		1				10		11		10		10		7				9		11		7		11		8			
	Pensions	Pension reserves		9																				3								9				7				6										
	Foreign direct investment	Foreign direct investment (FDI)																																															
Monetary aggregates	Economic and financial capital	Place holder																																															
	Natural capital																																																
	Human capital																																																
	Social capital																																																

Table VIII.1 Data availability in the UN, OECD and Eurostat databases for the 94 TFSD indicators for 46 countries (continued)

Theme	Sub-theme	Indicator	Portugal				Slovakia				Slovenia				SouthAfrica				Spain				Sweden				Switzerland				Turkey				UK				USA			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
Subjective Well-being	Life satisfaction	Life satisfaction				4				3				4								4				4				2				4							
Consumption and income	Consumption	Final consumption expenditure	11	11	11		11	11	11		11	11	11		11	11			11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11	11	
	Gross Domestic Product	GDP per capita	11	11	11		11	11	11		11	11	11		11	11			11	11	11		11	11	11		11	11	11		11	11	11		11	11	11		11	11	11	
	Productivity	Labour productivity		11	11			11	11			11	11							11	11			11	11			11	9			11				11	10			11	10	
	Official Development Assistance	Official Development Assistance	11	11	7				7				7						11	11	7		11	11	7		11	11	7				7			11	7		11	11		
	Imports from developing countries	Imports from developing countries	11	11	11		11	11	11		11	11	11		11				11	11	11		11	11	11		11	11			11	11			11	11	11		11	11		
	Distribution-Income-Total	Income inequality		2	11			1	6			1	10							2	11			2	9			2	3			1	3			2	10			2		
	Distribution-Income-Gender	Gender pay gap			3				3				3							5	3			9	3			8								9	3			9		
Nutrition	Obesity	Obesity prevalence		1			1	2	1		1	1	1			3			1	4	1		1	10			1	2			1	3				10				10		
Health	Life expectancy	Life expectancy at birth	2	10	10		2	10	10		2	10	10		2	10			2	10	10		2	11	10		2	10			2	10			10	9				10		
	Healthy life expectancy	Healthy life expectancy at birth	1		10		1		5		1		5		1				1		10		1		10		1				1						8					
	Mental health	Suicide death rate		7	10			8	10			10	10							9	10			9	10			8	8							9	10			8		
	Health expenditures	Health expenditures	7	5	5		7	6	5		7		6		7				7	6	6		7	6	6		7	6	6		7	4				6				6	6	
	Smoking	Smoking prevalence	1		1		1	3	1		1		1		1				1		1		1		1		1		1		1					10	1			5		
	Distribution-Health	Distribution-health																																								
Labour	Employment rate	Employment rate	10	10	11		10	11	11		10		11		9				10	11	11		10	11	11		10	10	11		10	10	5			10	11		10	11	11	
	Hours worked	Hours worked	10	11	9		10	11	9		9		9						10	11	9		9	11	9		10	9	9		1	11	3			11	9		10	11		
	Retirement	Average exit age from labour market			6				7				4								9				9				8								9					
	Distribution-Labour-Gender	Female employment rate	7	11			7	11			7	11			7				7	11			7	11			7	10			7	11				11				11		
	Distribution-Labour-Age	Youth employment rate			11				11				11								11				11				11				5				11					
	Migration	Migration of human capital																																								
Education	Educational attainment	Educational attainment	10	6	11		10	6	11		10		11						10	6	11		10	6	11		10	6	11		10	6	5		10	6	11			6		
	Basic competencies	Expenditures on education	8	3	9		9	2	9		8		8		11				9	3	9		9	3	9		9	3	8		6	2	6		9	3	9			3	9	
	Education	Competencies	1	9				9			1	5							1	9				9				9			1	6				9				9		

Theme	Sub-theme	Indicator	Portugal				Slovakia				Slovenia				SouthAfrica				Spain				Sweden				Switzerland				Turkey				UK				USA			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	expenditures																																								
	Participation in education	Early school leavers			11		9		9		3		10		3				2		11		9		11				11		5					10						
	Life long learning	Lifelong learning			8				8				8								8				8				7			5				8						
	Distribution-Education	Distribution-education																																								
Housing	Housing stock	Housing stock																																								
	Investments in housing	Investment in housing																																								
	Quality of housing	Living without housing deprivation			6				5				5								6				6				2			1				5						
	Housing affordability	Affordability																																								
Leisure	Time use	Leisure time											1								1															1						
Physical safety	Crime	Death by assault/homicide rate	6	7	10		6	8	10		6	10	10		6				6	9	10		6	9	10		6	8	8		6					9	10			8		
	Safety expenditures	Expenditures on safety																																								
Land and ecosystems	Land	Land assets																																								
	Protected areas	Protected areas	8		8		8		6		8		6		8				8		8		8		8		8				8						8					
	Soil quality	Nutrient balance		1	9			1	10				9							1	9			1	10			1	9			1				1	10			1		
	Emissions to soil	Emissions to soil																																								
	Species/Ecosystems	Bird index																			9				9				9							9						
	Threatened species	Threatened species		1				1				1								1				1				1				1				1				1		
	Footprint	Land footprint (foreign part)																																								
Water	Resources	Water resources	8	1			8	1			9	1			1				6	1			10	1			8	1			2	1				1				1		
	Abstraction	Water abstractions	1				7				8				1				9				8				7				2								1			
	Water quality	Water quality index																																								
	Emissions to water	Emissions to water																																								
	Footprint	Water Footprint (foreign part)																																								
Air quality	PM concentration	Urban exposure to particulate matter	7		10		7		10		7		8		7				7		10		7		10		7		10		7		2		7		10					
	PM emissions	Emissions of particulate matter		9				9				9								9								9								9				9		
	Ozone concentration	Urban exposure to ozone			10				10				10								10				10				10							10						
	Ozone emissions	Emissions of tropospheric ozone																																								
	Acidifying emissions	Emission of acidifying	6	10	10		6	10	10		6	10	10						6	10	10		6	10	10		6	10	10		6	10	10			10	10		6	10		

Theme	Sub-theme	Indicator	Portugal				Slovakia				Slovenia				SouthAfrica				Spain				Sweden				Switzerland				Turkey				UK				USA			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
		substances																																							
Climate	State of the climate	Global CO2 concentration																																							
	Historical CO2-emissions	Historic CO2 emissions																																							
	GHG emissions	GHG-Emissions	9	10	10		9	10	10		9	10	10						9	10	10		9	10	10		9	10	10			10	10		9	10					
	GHG intensity	GHG-Emissions Intensity																																							
	Footprint	Carbon footprint (foreign part)																																							
	State of the ozone layer	State of the ozone layer																																							
	Ozone depleting emissions	CFC emissions													7												7				7								7			
Energy resources	Resources	Energy reserves																																							
	Consumption	Consumption	8	11	11		8	11	11		8	11	11		8	10			8	11	11		8	11	11			11	10		8	11	10			11	11		8	11		
	Intensity/Productivity	Energy intensity	6		10		6		10		6		10		6				6		10		6		10		6		10		6		10				10		6		10	
	Renewable energy	Renewable energy	6	11	4		6	11	4		6	11	4		6	10			6	11	4		6	11	4			11			6	11				11	4		6	11		
	Imports	Import of energy resources	11	11	11		11	11	11		11	11	11		11				11	11	11		11	11	11		11	11			11	11			11	11	11		11	11		
	Energy dependence	Energy dependence			10				10				10								10				10				10				10				10					
Non-energy resources	Resources	Non-energy reserves																																							
	Consumption	Domestic material consumption		6	8			6	8				8							6	8			6	8			6	8			6	8			6	8			6		
	Intensity/Productivity	Resource productivity		6	8			6	8				8							6	8			6	8			6	8			6	8			6	8			6		
	Waste	Generation of waste	10	11	3		10	11	3		10	11	3			1			10	11	3		10	11	3		10	11			10	11	3			10	3		3	10		
	Recycling	Recycling rate			10				7				6								10				10												10					
	Imports	Import of non-energy resources	11	11	11		11	11	11		11	11	11		11				11	11	11		11	11	11		11	11			11	11			11	11	11		11	11		
Trust	Generalised trust	Generalised trust				4				3				4								4				4				4				2				4				
	Bridging social capital	Bridging social capital																																							
	Family/Friends	Contact with family and friends				4				3				4								4				4				4				2				4				
	Voluntary work	Participation in voluntary work				4				3				4								4				4				4				2				4				
Institutions	Voter turnout	Voter turnout			2				2				2								1				1				1				1				2					
	Trust in institutions	Trust in institutions			5				5				5								5				5					5							5					
	Distribution-Institutions-Gender	Percentage of women in parliament	11				11				11				11				11				11				11				11								11				

Theme	Sub-theme	Indicator	Portugal				Slovakia				Slovenia				SouthAfrica				Spain				Sweden				Switzerland				Turkey				UK				USA			
			UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other	UN	OECD	Eurostat	Other
	Global social capital	Contribution to international institutions																																						
Physical Capital	Capital stock	Capital stock										10												7																9		
	Investment	Gross capital formation	10		11				11		10		11		11				10		10		10		11		10		10		11						10			
	Exports	Export of physical capital	11	11	11		11	11	11		11	11	11		11				11	11	11		11	11	11		11	11			11	11			11	11	11		11	11		
Knowledge Capital	Capital stock	Capital stock																																						
	R&D expenditures	R&D expenditures	8	11	11		8	11	11		8	11	11		6	7			8	11	11		7	9	9		2	3	3		8	11	10		9	11	11			10	9	
	Knowledge spillovers	Knowledge spillovers			1				1				1								1				1																
	Exports	Export of knowledge capital																																								
Financial capital	Net assets/liabilities	Assets minus liabilities		11	11			11	11			10	10							11	11			11	11				10								11					
	Government debt	Government debt		11	11			11	11			8	11							11	11			11	11			11				11	9			11	11			11		
	Deficit/Surplus	Current deficit/surplus	10		11				11		10		11		10				10		11				11		9				4		9				11		10			
	Pensions	Pension reserves		8																9				9															9			
	Foreign direct investment	Foreign direct investment (FDI)																																								
Monetary aggregates	Economic and financial capital	Place holder																																								
	Natural capital																																									
	Human capital																																									
	Social capital																																									

ANNEX IX. INTERPRETATION AND VISUALISATION OF SDI SETS: SELECTED EXAMPLES FROM OFFICIAL STATISTICS

451. Annex IX focuses on interpretation and visualisation techniques that could be used to support the communication of sustainable development indicators. The scope of the Annex is limited to experiences within national statistical offices and relevant government ministries involved in the compilation of official sets of sustainable development indicators. It does not necessarily reflect experience outside of these organisations, which is also numerous and varied.

IX.1. Introduction

452. The communication of official statistics has changed remarkably over the past twenty years, with new technologies enabling new products and new ways of communicating. Many organisations have moved from paper-based reports as their key dissemination method to website portals of varying kinds.

453. Key challenges facing many organisations are creating awareness among users, differentiating official statistics from the myriad of information available, and engaging with different audiences. Several countries have produced sustainable development indicator sets, but there has been varied success in their communication. Some of the problems sighted are the complexity of the subject matter and the large size of some sustainable development indicator sets.

454. When thinking about how to communicate sustainable development indicators, there are two useful information sources which can provide a framework. The first is the United Nations Fundamental Principles of Official Statistics which are provided in Table IX.1. Good practice governing the collection of data, confidentiality, privacy and release should be followed by national statistical offices in accordance with these principles. For non-statistical organisations they provide helpful guidance.

455. The second source is the Key Dimensions of Data Quality, which are also used in official statistics and form the basis of data quality frameworks in many countries and international organisations. While there are variations in the labels, the descriptions are often similar. Table IX.2 provides a list of the key dimensions of data quality.

456. This Annex relies upon these two sources to discuss interpretation (section IX.1) and visualisation techniques (section IX.2).

IX.2. Interpretation

457. According to the Oxford English dictionary, the word interpretation means “the action of explaining the meaning of something”. In the context of indicators and other statistical information, it means assisting users of the data to understand the meaning of the information presented.

458. Table IX.2 distinguishes six key dimensions that are commonly used to assess the quality of statistics. The discussion on interpretation will focus on the first four of these dimensions – namely Relevance, Coherence/Consistency, Interpretability, and Accuracy – while the other dimensions of quality – Accessibility and Timeliness – will be covered under visualisation.

459. *Relevance* is critical to all statistical information and sustainable development indicators are no different. Relevance means that user needs must be factored into the choice of statistical framework,

the use of language and terminology and the presentation of the information. In the case of sustainable development indicators, the design of the conceptual framework is important but equally important is the ability to communicate the concepts in a way that resonates with the intended audience. This will usually include the general public, implying that the language and style become very important.

Table IX. 1. United Nations Fundamental Principles of Official Statistics

Principle 1	Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy, and the public with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information.
Principle 2	To retain the trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including scientific principles and professional ethics, on the methods and procedures for the collection, processing, storage and presentation of statistical data.
Principle 3	To facilitate a correct interpretation of the data, the statistical agencies are to present statistical information according to scientific standards on the sources, methods and procedures of the statistics.
Principle 4	The statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics.
Principle 5	Data for statistical purposes may be drawn from all types of sources, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.
Principle 6	Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.
Principle 7	The laws, regulations and measures under which the statistical systems operate are to be made public.
Principle 8	Coordination among statistical agencies within countries is essential to achieve consistency and efficiency in the statistical system.
Principle 9	The use by statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems.
Principle 10	Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries.

Table IX.2. Key Dimensions of Data Quality

Dimension	Description
Relevance	The degree to which the statistical product meets user needs in coverage, content and detail.
Coherence/ Consistency	The degree to which statistical information can be successfully brought together with other statistical information within a broad analytical framework and over time.
Interpretability	The availability of supplementary information and metadata necessary to interpret and use the statistics effectively.
Accuracy	The degree to which the information correctly describes the phenomena it was designed to measure.
Accessibility	The ease with which users are able to access and understand the statistical data and its supporting information.
Timeliness	The degree, to which the data produced are up to date, published frequently and delivered to schedule.

460. The use of a key indicator set is one way to assist the audience in understanding sustainable development without having to 'wade' through a number of themes or topics and corresponding indicators. It can allow the key messages in the data to be summarised and often visualised in a more accessible way. Having a hierarchical structure or typology for the indicator set are additional ways in which the indicators can also be made more accessible.

461. Relevance also involves a degree of research into understanding the audience for the statistics and their use for the information that will eventually be communicated. There are several different ways that statistical offices can approach this. Policy makers are regularly targeted as a key group for engagement, because a key use of the sustainable development indicators is to support policy decision-making and monitoring.

462. Another group that in many countries is becoming increasingly influential are non-government organisations (NGOs). They often represent community interest across a diverse group of audiences and can be a good bridge to understanding the needs of broader audience.

463. As with other statistical developments and products, it is important to engage with a range of users to assess their needs and to manage their expectations. The Stiglitz-Sen-Fitoussi Report also discussed the communication of statistics, and highlighted the importance of understanding different audiences, particularly the general public in the design and communication of statistics.

464. There are several ways in which engagement with users can be undertaken. With the advent of websites in particular, social networking and 'Wikis', reaching a large audience, are not as prohibitive in terms of cost as it was before.

465. Workshops and focus groups are also a useful way to get direct feedback on different aspects of the statistics, particularly during the development phase. These can be targeted at different groups or involve a good cross-section of the audience that you intend to reach. Surveys, whether paper-based or on-line, are another way to reach people and seek their input.

466. These methods all seek to reach a large number of people who are interested in sustainable development indicators. However, consideration needs to be given to the different levels of engagement and to the groups who are key influencers.

467. This group can include ministers, heads of government departments, business leaders, and local or community leaders. Thinking about the breadth and depth of engagement ensures that there is good support for the sustainable development indicator set, which generates greater interest in the results and ultimately, greater use.

468. Maintaining *Coherence/Consistency* is challenging when several topics and indicators are covered. Compiling sustainable development indicators is often a good test of the official statistics systems that are operating within countries. The use of common concepts, standards and the availability of long-term time-series are challenges that are often confronted, as well as identifying gaps and areas where quality improvements are required.

469. Establishing good working relationships with the various producers of official statistics, both within statistical organisations and with policy agencies, universities and research institutes is important. Often the data have already been released or made publicly available, and attention needs to be given to the possibility of conflicting messages. Placing the statistics in a different context may mean a different conclusion, and it is important not to confuse users. For example, increasing household consumption expenditure is usually reported as 'good' in the context of analysis of standards of living but may viewed negatively if it increases waste to landfills and degrades the environment.

470. *Interpretability* is a key part of the communication of official statistics in general, and of sustainable development indicators in particular. It is important to think about the metadata and supporting information that is required to enable the statistics to be correctly interpreted. It may be necessary to describe the limitations and caveats to the indicators and the set itself. In some cases, this may extend to statements on the fitness for purpose and data quality thresholds that apply in each country.

471. The experimental nature of some measures should be drawn to the attention of users to ensure that governments and communities understand that this is an area of statistics subject to experimentation and research. Many countries include within their reports sections relating to interpretation, sources and methods. Ideally, countries will also make available the data used to compile the report through various means,.

472. *Accuracy* is broader than just ensuring numerical accuracy. It also reflects the ability of the conceptual framework and indicators selected to describe the phenomena it was designed to measure.

473. The conceptual framework provides the definition for sustainable development and the scope for the selection of indicators. It allows users to understand the concepts and theory underpinning the framework and then to assess its application to a set of indicators.

474. A well-defined framework is also much easier to communicate and the selection of indicators flows more logically from it. Along with the conceptual framework, selection criteria are used to evaluate and select indicators for sustainable development. Many countries have developed criteria with only slight variations and they are often used across indicator reports in general, not just those pertaining to sustainable development. Both the conceptual framework and selection criteria should be agreed and potentially published before the actual selection and evaluation takes place as this helps to maintain the integrity of the selection process.

475. One of the critical differences for compilers of sustainable development indicators is the 'normative' nature of the concept of sustainable development. "Development" tends to have a positive connotation, that is, development is associated with a better future (WGSSD, 2009).

476. However, whether a given change is regarded as good or bad involves value judgements over which it is often difficult to come to an agreement. This is in contrast to many other key statistics such as inflation (usually measured by various price measures including a Consumer Price Index) where there is generally less debate about whether increasing prices are good or bad.

477. All countries try to assist their users to understand the meaning of the information. In the case of sustainable development, a similar approach is generally taken. At the core, there is a need to have a frame of reference against which the indicators can be measured.

478. Table IX.3 provides a summary of the frame of reference that is used by a selection of 27 countries. The table shows that most countries use stated policy targets as the frame of reference. Conversely, other countries that may not have specific policies or strategies for sustainable development tend to identify desired trends from their conceptual framework. Comparison with other countries is another point of reference which is regularly employed, usually comparing European or OECD countries.

479. The type of report follows on from the frame of reference and the selection criteria. This refers to the level of analysis that will be attempted and the types of conclusions that may or may not be drawn from the indicator analysis.

Table IX.3. Interpretation methods used on selected countries

	Interpretation		
Country	**Policy Target**	**Desired Trend**	**Country comparison**
Australia		☑	☑
Austria	☑		☑
Belguim	☑	☑	
Brazil	Reported no experience yet		
Bulgaria	☑		☑
Canada		☑	
Estonia			☑
European Commission	☑	☑	☑
Finland	☑		
France	☑		☑
Germany	☑	☑	
Hungary	☑		☑
Latvia	☑		☑
Lithuania	☑		☑
Luxemburg			
Republic of Macedonia			☑
The Netherlands		☑	☑
New Zealand		☑	
Norway	☑		
Poland	Reported no experience yet		
Portugal	☑		☑
Romania			
Slovakia	☑		☑
Spain			☑
Sweden		☑	
Switzerland		☑	☑
United Kingdom		☑	☑

Note: Australia measures "progress" rather than sustainable development but is included in this analysis.

480. A report may be narrative, describing the statistics, identifying trends but not making any judgements about interpretation, leaving this completely to the reader; or can be more analytical, making informed judgements or interpreting the statistics to assist the reader; or it can be a policy document, which uses the statistics to support policy analysis or recommendations. In any case, it is useful to discuss and decide from the outset what the purpose and the type of report or product that will be produced.

IX.3. Visualisation

481. One critical aspect of *Accessibility* is to ensure that sustainable development indicators are compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information. This refers back to Principle 1 of the UN Fundamental Principles of Official Statistics. Commonly referred to as 'equal access', the release process needs to manage this aspect of accessibility.

482. Often the difference between sustainable development indicators and other official statistics is that the former may have already been published or released in their own right. However, the indicators to measure sustainable development are being analysed in a different context and so the results may be perceived and reported differently. Maintaining the integrity of the report is important to ensure that results do not and are not perceived to have bias.

483. The conceptual framework and the selection criteria can play an essential role in terms of impartiality. Using internationally accepted methodologies, standards and selection criteria limits the opportunities for agencies to unduly influence the indicator selection and their interpretation. Using a statistical framework rather than a policy-based framework can also help manage perceptions if the government of the day and therefore policy initiatives change.

484. Understanding the preferences of the intended audience for various statistical products and channels is also important for this principle. Statistical products can represent the 'what' whereas channels can represent the 'how' information is communicated.

485. The effective use of technology is a key enabler in accessibility but its use must be appropriate for the audience. If a web-based report which users cannot access without high-speed broadband is produced, it could diminish the reach and usefulness of the statistics in some countries. But in other countries, this form of dissemination can be expected as the norm. The sharing of best practice is always a good starting place but remembering to adapt for the circumstances within a country is important for success.

486. There are several ways to communicate sustainable development indicators, from on-line dashboards to paper-based publications. The decision about what products to produce requires an understanding of the audiences and their needs, the channels available and their cost, and the framework and size of the indicator set. There are several good examples from different countries as to how the information can be communicated.

487. Visualisation encompasses new and creative ways to attract and assist users in their understanding of statistical information. It is an important and growing area that supports the accessibility of sustainable development indicators.

488. The use of visualisation techniques can be a powerful way to engage users about sustainable development indicators and statistics in general. It also allows the linking of information via web-pages and websites.

489. Many users now expect to have access to the data used in the compilation of the indicators, so it is useful to think of these data as a statistical product in its own right and to consider the types of audiences and their needs. With a large set of indicators, this can mean a considerable amount of information to manage and communicate. It also requires liaising with the original producers of the information, whether internal or external to the organization, about their expectations for making available their information.

490. Many sustainable development publications contain a large number of indicators that need to be organised, analysed and written about. Many countries use different ways to visualise the results, which range from 'traffic lights' to 'weather symbols' to 'ticks and crosses'. Whatever the symbol, its purpose and description should be clear.

491. Table IX.4 identifies, for a range of countries, the key visualisation techniques for sustainable development indicator sets. Graphs, charts and maps are among the more traditional tools employed by countries, while colour schemes, symbols and how to specify the expected direction allow more creative ways in which to visualise data.

492. Web tools represent both the latest thinking on visualisation techniques but also a significant investment in research and resources. Annex X provides a number of examples used in countries.

Table IX.4. Visualisation Techniques in Sustainable Development Reporting

Country	Graphs / Charts	Maps	Web Tools	Colours	Symbols	Direction
Australia	☑			☑	☑	
Austria	☑	☑				
Belguim	☑				↗➔↘	
Brazil	Reported no experience yet					
Bulgaria	No report found					
Canada	☑	☑	☑			
Estonia	☑		☑			
European Commission	☑				☼💧	
Finland	☑			☑	👍	
France	☑			☑	☺😐☹	☑
Germany	☑				☼💧	
Hungary	No report found					
Latvia	No report found					
Lithuania	☑	☑				
Luxemburg	☑					
Republic of Macedonia						
The Netherlands	☑	☑	☑			
New Zealand	☑			☑	☑	☑
Norway	No report found					
Poland	Reported no experience yet					
Portugal	No report found					
Romania			☑			
Slovakia	No report found					
Spain	No report found					
Sweden	☑				☺😐☹	☑
Switzerland	☑		☑	☑	☑	☑
United Kingdom	☑			☑	☑	☑

Legend for Symbols	
☼💧	Weather symbol
☑	Ticks and crosses
☺😐☹	Faces
👍	Hands
↗➔↘	Arrows

493. In terms of *Timeliness*, the sooner the data can be compiled and made available the more useful it is for decision-making. While many countries provide regular updates, whether they are annual, two-yearly or five-yearly, it is important that the publishing dates are announced publicly well in advance, in order to safeguard the integrity of the report.

Conclusion

494. The communication of official statistics has changed remarkably over the past twenty years with new technologies enabling new products and new ways of communicating. There are two good sources which can be referenced in the communication of sustainable development indicators. The first is the United Nations Fundamental Principles of Official Statistics and the second is the Key Dimensions of Data Quality.

495. These two information sources help to frame the discussion of interpretation and visualisation in the communication of sustainable development indicators and provide useful guidance for producers and users alike.

ANNEX X. EXAMPLES OF VISUALISATION TOOLS USED IN THE CONTEXT OF INDICATOR SETS

496. This Annex reviews a number of experiences with visualisation tools produced by some of the organisations represented in the TFSD. This annex provides highlights of some of the SDI sets that are currently available. As an important aspect is the way in which the indicator sets are communicated, this annex pays special attention to this aspect.

497. The following indicator sets are included in the Annex-:.

- National Sustainable Development Strategy Indicators in France
- The Netherlands (Sustainability Monitor for the Netherlands)
- The indicators used in the context of the "OECD Better Life Initiative"
- Switzerland (MONET)

X.1. France (National Sustainable Development Strategy Indicators)

498. The French government has adopted the National Sustainable Development Strategy (NSDS) for the 2010−2013 period in July 2010. Drafting of the strategy involved numerous public and private sector partners. With the national strategy, an indicator scoreboard was adopted to facilitate monitoring of the NSDS and to contribute to its wide dissemination. Three "categories" of indicators are distinguished for the scoreboard: fifteen headline indicators relating directly to the issues covered by the strategy (level 1), four economic and social context indicators and thirty-five additional indicators relating to strategic choices (level 2).

499. The indicators were chosen within the framework of collaboration organised in accordance with the Grenelle's model of governance by five stakeholder groups. A commission constituted in line with this principle − and chaired by a member of the Economic, Social and Environmental Council − worked through the winter of 2010−2011 to select the scoreboard. This open and lively collaboration conveyed the importance of widespread uptake of the sustainable development indicators and of their potential role in the public debate.

500. The indicators were selected in accordance with several criteria. They were chosen to:

- illustrate the key issues for sustainable development in response to the NSDS's nine key challenges:
  - 1: Sustainable consumption and production;
  - 2: Knowledge society (education and training, research and development);
  - 3: Governance;
  - 4: Climate change and energy;
  - 5: Sustainable transport and mobility;
  - 6: Conservation and sustainable management of biodiversity and natural resources;
  - 7: Public health, risk prevention and management;
  - 8: Demographics, immigration, social inclusion;
  - 9: International challenges of sustainable development and fight against world poverty;
- be consistent with the European headline indicators;
- be applicable to infra national territories (including overseas territories), to give expression to the concerns of populations as comprehensively as possible and as close as possible to the grassroots;
- provide information on breakdown by social category, income class, age or gender.

501. All the indicators are updated every year, for submission to French Parliament of the annual report on implementation of the NSDS for 2010−2013. The General Commission for Sustainable

Development coordinates the annual report. SOeS and Insee, with contribution from other ministerial statistics departments, calculate and update the indicators.

502. Other French works about the sustainable development measurement

- In September 2009 the Stiglitz-Sen-Fitoussi Commission submitted its report on the measurement of economic performance and social progress to the President of the French Republic. For 2009, the Observation and Statistics Directorate of the General Commission on Sustainable Development (CGDD / SOeS) has undertaken many investments that follow the «Stiglitz» report's recommendations: new SDIs, carbon and water footprints, material efficiency and productivity, environmental data consistent with national accounts, indicators about environmental not paid costs. The Insee pioneered work in analyzing the dispersion of income and of consumption in the national accounts or in preliminary results from surveys on the measured or perceived quality of life. At the European level, since 2010, Insee and Eurostat engaged a Sponsorship with fifteen National Statistical Institutes of 15 other EU countries to take into account the recommendations of the Stiglitz-Sen-Fitoussi report and to address their operational implementation. In October 2011, a large conference in the OECD headquarter shed the light on what has been accomplished since the Stiglitz-Sen-Fitoussi report.
- Moreover, France pursuied the work on sustainable development indicators to help territorial actors: a referential of about fifty indicators at the regional or local level has been published with interministerial collaboration, a framework to assess the effects of a sustainable development strategy like "Local Agenda 21" at the level of a community (result of an extensive consultation with towns and local actors, this standard provides a set of evaluative questions and indicators related to key policies of a Local Agenda 21, focused on the strategic dimension of evaluation).

X.2. The Netherlands (Sustainability Monitor for the Netherlands)

503. Statistics Netherlands uses a system that is nearly identical to the framework presented in this report. It therefore uses a conceptual (56 indicators) and thematic categorisation (129 indicators) to measure sustainable development (CBS, 2009; 2011; Smits and Hoekstra, 2011).

504. Figure X.1 presents the visualisation of the conceptual categorisation of SDIs. Similar to the TFSD report, the table is split into the 'Here and now' ("quality of life"), 'Later' ("resources") and 'Elsewhere' ("Netherlands in the world"). Each of these three dimensions is divided into sub-sections which each may have one or more indicators. For each of the indicators data are collected for the trend (2000 to present) and the comparison between 27 countries of the European Union.

505. Figure X.1 provides a summary of the indicators in pie charts. The indicators are given a green, yellow or red colour depending on the development (pie charts on the left side) or the ranking of the Netherlands in the European Union (pie charts on the right hand side). For example, the category "well-being and material welfare" has two indicators. In terms of their development from the year 2000 to the present one is stable and one is increasing. This is why the pie chart to the left is 50% green and 50% orange. On the right, the pie chart shows that the Netherlands scores in the top 9 of EU countries because the whole pie chart in green (the top third of countries is given a green score, etc).

506. The visualisation works well to make clear the trade-offs between the 'here and now', 'later' and 'elsewhere'. Clearly, the "quality of life" indicators are predominantly green while many indicators for 'later' (in particular natural capital, human capital and social capital) and 'elsewhere' are yellow or red. The visualisation therefore helps to bring home the message that the developments in current well-being are unsustainable because of their repercussion for future generations and other countries.

507. Figure X.2 shows the thematic categorisation. 14 themes are distinguished for which a total of 129 indicators have been chosen. The pie charts are constructed in the same way as the conceptual categorisation.

508. The web-based visualisation allows the user to access the data which underlies the pie charts. For example, if a user clicks on the theme "education and knowledge", Figure X.3 appears. For each of the indicators of this theme, the development and the international rank of the Netherlands is provided. For example, Figure X.2 shows the education level of the Netherlands.

509. More information can be found on the website of the Sustainability Monitor for the Netherlands. http//www.cbs.nl/en-GB/menu/themas/dossiers/duurzaamheid/nieuws/default.htm?Languageswitch=on

Figure X.1. Visualisation- The Netherlands (Conceptual categorisation)

Figure X.2. Visualisation- The Netherlands (Thematic categorisation)

Figure X.3. Visualisation- The Netherlands (Indicator details)

X.3. OECD (Better Life Initiative)

510. The "Your Better Life Index", released by the OECD in May 2011, at the occasion of its 50th Anniversary, is an interactive index, allowing users to assess average well-being across countries by assigning their own weights to various life dimensions. The index is based on the framework used in the OECD report "How's Life?". It distinguishes between two broad domains of human well-being ('material living conditions' and 'quality of life') and eleven dimensions within these (income and wealth, jobs and earnings, and housing, for the domain of 'material living conditions'; health status, education and skills, work and life balance, civic engagement and governance, social connections, personal security, environmental quality and subjective well-being, for the domain of 'quality of life').[40]

511. To compare and aggregate country-level indicators for dimensions expressed in different units, values are first normalised according to a formula that converts the value of the original indicator into a number ranging between 0 (for the worst outcome) and 1 (for the best outcome). To choose weights, users are prompted to rate each dimension from 0 (i.e. "this dimension does not matter to me") and 5 (i.e. "this dimension is very important to me"). Countries can then be ranked according to the overall value of the "Your Better Life Index", which is displayed in the form of 'flowers' (with the height of

[40] For further information on the OECD Better Life Initiative see: http://www.oecd.org/document/0/0,3746,en_2649_201185_47837376_1_1_1_1,00.html

the 'flower' indicating countries' average performance, the width of each of the eleven 'petals' indicating the importance that users have attached to them, and the length of the petal showing performance in the dimension considered, Figure X.4.).

512. When considering human well-being, households and people are the relevant units of analysis. For this reason, the "Your Better Life Index" excludes nation-wide indicators of economic performance such as national income, wealth and productivity, while including only indicators computed at household level. Both objective and subjective measures are used to build the Index. The underlying data mostly come from databases of international organisations (OECD, Eurostat, United Nations) and national statistical offices. However, a few indicators, for pertaining to dimensions where comparable data from official sources are currently lacking, come from the Gallup World Poll, a household survey conducted by the Gallup Organization in more than 140 countries around the world based on a common questionnaire, translated into the predominant languages of each country, and based on samples that (with few exceptions) are nationally representative of the resident population aged 15 and over in the entire country (including rural areas).

513. By aggregating several dimensions and indicators of well-being into a single measure, the "Your Better Life Index" provides an easy-to-read summary of average well-being patterns across the 34 OECD countries. While composite indices are often criticised for assigning weights on an arbitrary basis, reflecting an expert's (rather than citizens') view of the world[41], the "Your Better Life Index" addresses this problem by letting people express their own concerns and values. If, for instance, users consider health status and environmental quality as the most important aspects of their lives, they will have the possibility to rank them higher than other dimensions, and be able to see how countries perform in terms of overall well-being when these dimensions are more prominent than others. Users are also encouraged to share their Index with their friends and with the OECD, hence providing information on users' choices of weights across countries and demographic groups. The web application of the "Your Better Life Index" also provides a gateway to other OECD work on well-being and progress.[42]

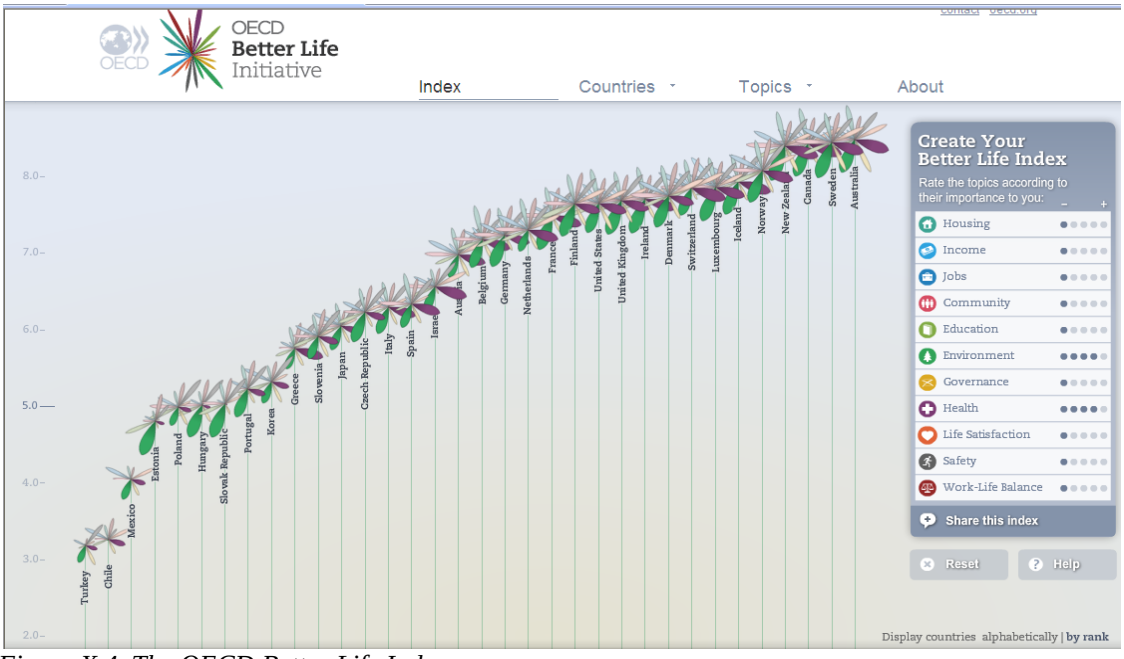

Figure X.4. The OECD Better Life Index

[41] See OECD(2008), Boarini *et al*. (2011)
[42] Further information can be found at: http://www.oecdbetterlifeindex.org/

X.4. Switzerland (MONET)

514. Switzerland uses a conceptual framework based on a frame of reference and a systemic structure to monitor sustainable development. For details of this monitoring system, called MONET, that comprises 75 indicators see de Montmollin and Scheller (2006) or FSOs, ARE and SAEFL (2004). Each indicator is published on the internet and evaluated according to the observed trend. The evaluation is communicated by traffic light symbols. The evaluation is positive (green, moving towards sustainability) when the observed trend is in line with the target trend (defined by the frame of reference), negative (red, moving away from sustainability) when the observed trend is opposite to the target trend and neutral (yellow) when there is no significant change.

515. An extract from the whole MONET system is dedicated to the monitoring of the Swiss Federal Council's Sustainable Development Strategy (Federal Council 2008). The Sustainable Development Strategy (SDS) is structured into 11 thematic action areas (called "key challenges"). Each thematic action area is accompanied by five MONET indicators (so that each indicator has the same importance), which means that the extract from the whole system aiming at the monitoring of the SDS comprises 60 indicators.

516. Switzerland uses a visual aggregation method called Dashboard[43] to synthesise the information delivered by these 60 indicators. This method uses the common unit of all indicators, which is the traffic light symbol set by the evaluation of each indicator. The Dashboard of the SDS presents an overall image of the 11 key challenges as well as the possibility of consulting each key challenge or indicator separately. These elements are described subsequently.

The home page

517. The three primary objectives of "Social Solidarity", "Economic Efficiency" and "Environmental Responsibility" are shown on the home page (see Figure X.5). On the right side the 11 key challenges are visible. When the cursor is dragged over the key challenges, the indicators of the respective key challenge appear in the corresponding primary objective.

518. Thus, on the home page the following information is available: which indicators are part of the key challenge and how they are located in the three primary objectives of sustainable development. The colour on the left side of the indicator shows the trend evaluation.

The single pages

519. Each key challenge can be viewed separately by clicking on it on the right side. 5 indicators (or fewer if data are still lacking) measure the progress of a key challenge. To get the summarised trend evaluation of a key challenge (i.e. the position of the pointer on the scale from red to green), the following sum is made implying the evaluation of the five indicators: A positive evaluation is +1, a negative -1 and a neutral evaluation 0. The red-to-green-scale can therefore reach from -5 (red) to +5 (green) through zero. The five parameters (one per indicator) are aggregated and result in the evaluation of a key challenge. The summarisation-process is shown dynamically with a moving white pointer (see Figure X.6.).

520. The chart of each indicator can be displayed by clicking on the labels of the indicators (see Figure X.7). The curve on the chart illustrates the trend evaluation. It is possible to get further information by clicking on "Weitere Informationen" on the bottom of the chart. This link leads to the MONET indicators system where information such as the meaning of the indicator, methodological background information about the data or an Excel file with the data is provided.

The overview page

521. The overall evaluation of the indicators measuring the Sustainable Development Strategy (see Figure X.8) is shown by the 11 red-to-green-scales (also shown separately on the single pages). They

[43] www.monet.admin.ch >> Cockpit (german) or >> Tableau de bord (french)

show an overall picture (the result of all 11 key challenges at a glance, i.e. the synoptic picture of all SDS indicators) but also the evaluation for each key challenge.

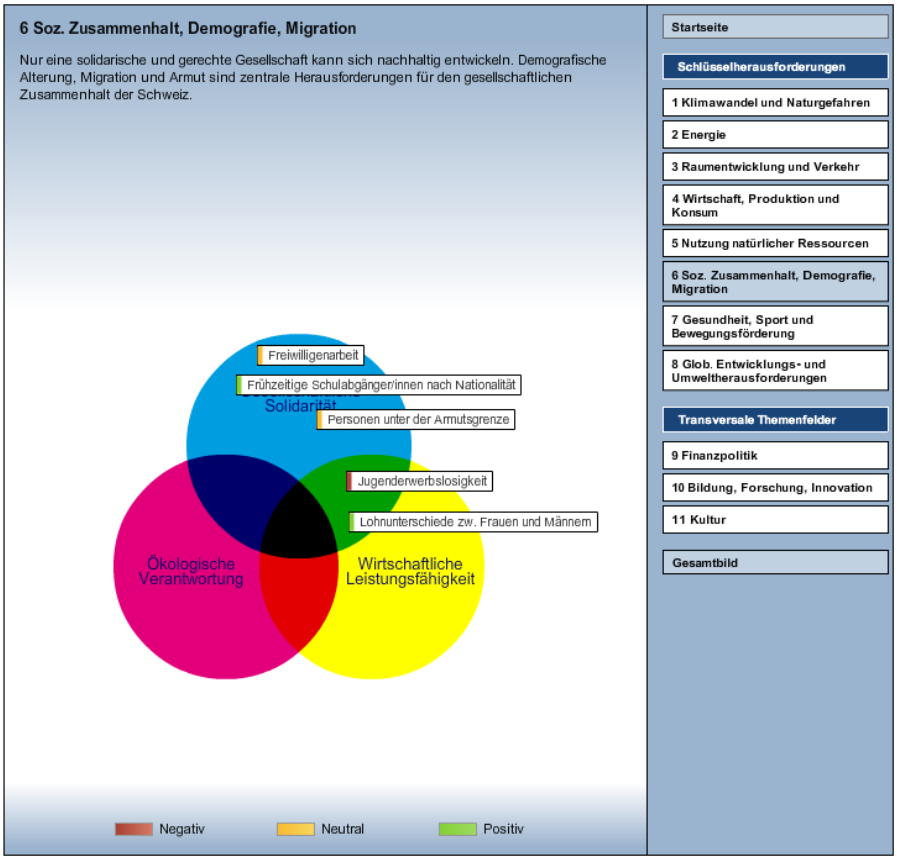

Figure X.5. The home page and the position of the indicators in the three primary objectives

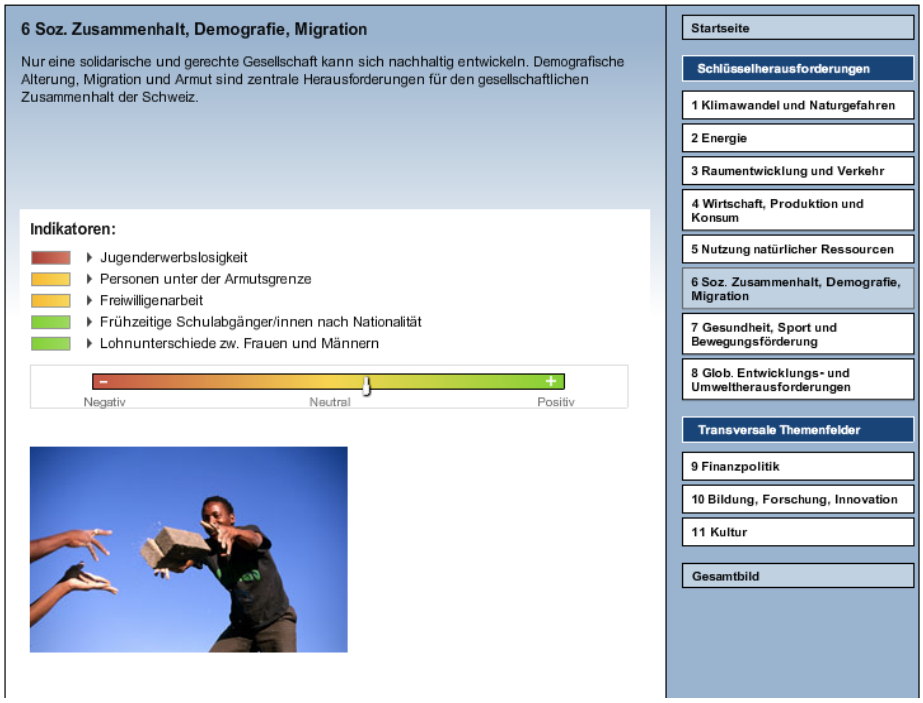

Figure X.6. The single pages

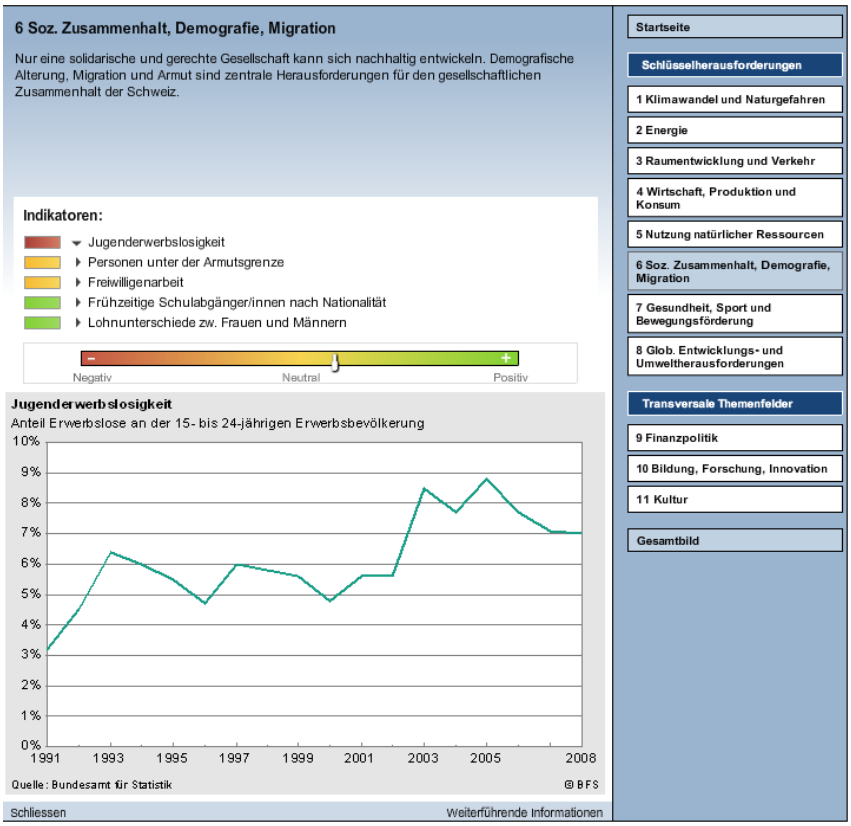

Figure X.7. The single pages – chart and further information

Figure X.8.The overview page – showing the trend evaluations: in which direction are we going?

ANNEX XI. MILLENNIUM DEVELOPMENT GOALS

This Annex provides the list of targets and indicators of the Millennium Development Goals (MDG).

Millennium Development Goals (MDGs)	
Goals and Targets (from the Millennium Declaration)	**Indicators for monitoring progress**
Goal 1: Eradicate extreme poverty and hunger	
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	1.1 Proportion of population below $1 (PPP) per day[i] 1.2 Poverty gap ratio 1.3 Share of poorest quintile in national consumption
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed 1.5 Employment-to-population ratio 1.6 Proportion of employed people living below $1 (PPP) per day 1.7 Proportion of own-account and contributing family workers in total employment
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under-five years of age 1.9 Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment ratio in primary education 2.2 Proportion of pupils starting grade 1 who reach last grade of primary 2.3 Literacy rate of 15-24 year-olds, women and men
Goal 3: Promote gender equality and empower women	
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of girls to boys in primary, secondary and tertiary education 3.2 Share of women in wage employment in the non-agricultural sector 3.3 Proportion of seats held by women in national parliament
Goal 4: Reduce child mortality	
Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	4.1 Under-five mortality rate 4.2 Infant mortality rate 4.3 Proportion of 1 year-old children immunised against measles
Goal 5: Improve maternal health	
Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	5.1 Maternal mortality ratio 5.2 Proportion of births attended by skilled health personnel
Target 5.B: Achieve, by 2015, universal access to reproductive health	5.3 Contraceptive prevalence rate 5.4 Adolescent birth rate 5.5 Antenatal care coverage (at least one visit and at least four visits) 5.6 Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	6.1 HIV prevalence among population aged 15-24 years 6.2 Condom use at last high-risk sex 6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS 6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	6.6 Incidence and death rates associated with malaria 6.7 Proportion of children under 5 sleeping under insecticide-treated bednets 6.8 Proportion of children under 5 with fever who are treated with

	appropriate anti-malarial drugs 6.9 Incidence, prevalence and death rates associated with tuberculosis 6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course
Goal 7: Ensure environmental sustainability	
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.1 Proportion of land area covered by forest 7.2 CO2 emissions, total, per capita and per $1 GDP (PPP) 7.3 Consumption of ozone-depleting substances 7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources used 7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source 7.9 Proportion of population using an improved sanitation facility
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums[ii]
Goal 8: Develop a global partnership for development	
Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system Includes a commitment to good governance, development and poverty reduction – both nationally and internationally Target 8.B: Address the special needs of the least developed countries Includes: tariff and quota free access for the least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly) Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	*Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and small island developing States.* <u>Official development assistance (ODA)</u> 8.1 Net ODA, total and to the least developed countries, as percentage of OECD/DAC donors' gross national income 8.2 Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) 8.3 Proportion of bilateral official development assistance of OECD/DAC donors that is untied 8.4 ODA received in landlocked developing countries as a proportion of their gross national incomes 8.5 ODA received in small island developing States as a proportion of their gross national incomes <u>Market access</u> 8.6 Proportion of total developed country imports (by value and excluding arms) from developing countries and least developed countries, admitted free of duty 8.7 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries 8.8 Agricultural support estimate for OECD countries as a percentage of their gross domestic product 8.9 Proportion of ODA provided to help build trade capacity <u>Debt sustainability</u> 8.10 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) 8.11 Debt relief committed under HIPC and MDRI Initiatives 8.12 Debt service as a percentage of exports of goods and services
Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	8.13 Proportion of population with access to affordable essential drugs on a sustainable basis
Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	8.14 Fixed telephone lines per 100 inhabitants 8.15 Mobile cellular subscriptions per 100 inhabitants 8.16 Internet users per 100 inhabitants

The Millennium Development Goals and targets come from the Millennium Declaration, signed by 189 countries, including 147 heads of State and Government, in September 2000 (http://www.un.org/millennium/declaration/ares552e.htm) and from further agreement by member states at the 2005 World Summit (Resolution adopted by the General Assembly - A/RES/60/1, http://www.un.org/Docs/journal/asp/ws.asp?m=A/RES/60/1). The goals and targets are interrelated and should be seen as a whole. They

represent a partnership between the developed countries and the developing countries “to create an environment – at the national and global levels alike – which is conducive to development and the elimination of poverty”.