Framework and suggested indicators to measure sustainable development

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CONTENTS

MAIN MESSAGES

Why measure sustainable development?

1. There is a 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 resources to maximise current human well-being or preserving 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 pay due attention to current human well-being, including its distribution across and within countries, as well as to the intergenerational 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 between the approaches remain large. A conceptual framework is needed to harmonise the different ways in which sustainable development has been measured. Therefore, the UNECE jointly with the European Commission (Eurostat) and the OECD undertook this task by setting up a dedicated Task Force to develop such a framework. The framework, which is presented in this publication, may serve as an organising principle to facilitate users' choices through large numbers of indicators and to present the information in a concise manner. Although the publication is primarily aimed at statisticians, it may also be relevant for policymakers, as policy targets for sustainable development are increasingly being formulated at national and international levels.

Proposed conceptual framework

3. The framework aims to link the SDI sets 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, 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'). *Twenty themes* are distinguished, covering environmental, social and economic aspects of sustainable development: subjective well-being, consumption and income, nutrition, 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. Population has been added as a context indicator.

Theoretical and practical foundations of the framework

4. The proposed measurement system is based on the following sources:

   (a) *Brundtland definition*. The framework builds on the definition of sustainable development 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 Brundtland Report also argues that sustainable development is essentially about distributional justice, in both 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 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, and social aspects of sustainable development.

(c) *Stiglitz-Sen-Fitoussi report and other international initiatives.* The Stiglitz-Sen-Fitoussi Report gave an important impetus to the issue of measuring sustainable development. The framework developed by the Task Force stays close to the recommendations made by Stiglitz et al. The work by the European Commission (Eurostat), OECD and other international organisations related to measuring sustainable development has also been taken into account, 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 conceptual framework allows for a pragmatic approach in developing an SDI set. The selection of themes and indicators is based on an in-depth analysis of the sustainable development themes and indicators currently used in several national and international datasets.

Transboundary impacts

5. In an increasingly globalised world, the relationships between countries are becoming more and more important. An important conclusion 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 sets of potential indicators

6. Based on the measurement framework, a procedure to derive three indicator sets is proposed. The indicator sets include a large set of 60 indicators selected on a conceptual basis to provide information about the well-being in the 'here and now', 'later' and 'elsewhere'; a large set of 90 indicators selected on a thematic basis with more detailed indicators about policy drivers; and a small set of 24 potential indicators to communicate the main messages more efficiently to policymakers and the general public. The small set of indicators should be regarded as a possible way of narrowing down the number of indicators. Users may also find other ways to define a small dataset from the proposed large and comprehensive sets of potential indicators. As the aim is to identify indicators that are available for a wide set of countries, the publication does not prescribe how to select country specific indicators linked to sustainable development policies defined at country level.

Relevance of the framework

7. The framework 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. It strives to harmonise the measurement of sustainable development on a solid conceptual basis, and it proposes an indicator set without claiming to provide a one-size-fits-all solution. Although the proposed sustainability themes are universal, there is room for selecting country-specific indicators. The framework 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. The framework is expected to contribute to setting the Sustainable Development Goals and targets in such a way that they are measurable. Once the SDGs have been established, the suggested indicators can be aligned with the Goals.

Measuring sustainable development within the realm of official statistics

8. Important criteria for the selection of sustainable development indicators are that they are in line with the quality standards 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 suggested indicators are already produced by national statistical offices and collected by international and supranational organisations such as the United Nations and the European Commission (Eurostat). This particularly applies to the small set of indicators selected on the basis of their availability in a great number of international datasets. Other important criteria applied are the commonalities of the current SDI sets of countries, and the ability of indicators to describe the phenomena they are designed to measure.

SHORT NARRATIVE

Introduction

9. The publication presents a broad conceptual framework for measuring sustainable development and suggests sustainable development indicators that can be used for international comparison. While the publication is aimed primarily at statisticians, it may also serve as guidance to policymakers in setting targets for sustainable development policies and monitoring their implementation.

10. The publication is a step towards harmonising the various approaches and indicators already used by countries and international organisations to measure sustainable development. The framework takes into account existing approaches used by the various initiatives undertaken by United Nations, European Commission and the OECD, as well as initiatives of 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 work has been done 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 a report on measuring Sustainable Development in 2009[1]. The WGSSD focused mainly on the inter-generational issues of sustainable development using capital measures, while the new work also takes the well-being of the current generation into account.

Conceptual background (Part I of the publication)

12. A starting point for the framework is the Brundtland Report (1987), which defines 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 intragenerational aspects of human well-being, including the distribution of this 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'). This approach enables the user to distinguish to what extent the choices the present generation makes may lead to problems 'elsewhere' or 'later'.

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

15. Part II of the publication 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'.

[1] http://www.unece.org/fileadmin/DAM/stats/publications/Measuring_sustainable_development.pdf

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 starting out from 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 the current generation leaves behind. The abundant literature on capital measurement, discussed extensively in the 2009 WGSSD report, makes it relatively easy to distinguish the main themes of this dimension. The WGSSD agreed that 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 on future generations; it does not aim to forecast the well-being levels that may be attained by future generations.

19. The choice of themes for economic capital is based on the international standard, the System of National Accounts (SNA). The Central Framework of the System of Economic and Environmental Accounts (SEEA), adopted as a statistical standard in 2012, provides the basis for measurement of natural capital. However, the asset boundary used in the framework for measuring sustainable development is broader than in the SEEA 2012 Central Framework, as it also encompasses natural assets such as ecosystems and climate.

20. There are no international standards yet for the measurement of human and social capital. The publication reflects current developments in research in this area. Human capital is defined as the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being. 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.

21. 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'

22. 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 other countries via various channels. One example are the indicators on international aid from developed countries to 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, which calculate the environmental pressure attributable to consumption in one country on resources abroad.

23. 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

24. Inequality and distributional issues have a special importance in the measurement of sustainable development. Inequality is a cross-cutting issue relevant to most of the themes and indicators included in an 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 in relation to a peer group. Therefore, wherever possible, a breakdown of indicators for different groups (e.g. gender, age, ethnic background, etc.) is proposed.

Sustainable development indicators (Part III of the publication)

25. Part III of the publication focuses on selecting the potential indicators grouped in three indicator sets as proposed by the TFSD: two large sets of 60 and 90 indicators respectively, as well as a small set of 24 indicators. The suggested indicators should be viewed as example indicators, identified on the basis of commonalities between 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. The aim is to identify indicators that are available for a large number of countries and so enable international comparison. Therefore data availability is an important criterion for indicator selection.[2]

Two large indicator sets

26. There are two ways to structure an SDI set. The conceptual and thematic categorisations 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. The relationship between the conceptual and thematic categorisations is shown in Table 1:

(a) In the **conceptual categorisation** a set of proposed indicators is presented according to the dimensions 'here and now', 'later' and 'elsewhere'.

(b) In the **thematic categorisation**, the SDI set is organised according to the twenty themes defined in Part II of the publication. Here, the indicators are no longer allocated along the dimensions 'here and now', 'later' and 'elsewhere'. For example, education is one of the themes. The same indicators that are used to measure 'education' in the thematic categorisation, are used to measure both the well-being 'here and now' and the well-being 'later' in the conceptual categorisation. These links are marked with a cross in the relevant cells in Table 1. In addition to the 'core' indicators, indicators for the so-called 'policy drivers' are provided for each theme. These 'policy driver' indicators show how society (and policymakers) can influence the core indicators. In the case of education, for example, a 'policy driver' indicator could be the 'percentage of early school leavers'.

[2] Because of the emphasis on data availability and international comparability, the publication does not address issues of choosing indicators to cater for specific country situations. There is no prescription on how to select country specific indicators that are linked to sustainable development policies at country level. However, the Task Force aimed at providing an input to measuring sustainable development at a global level and contributing to actions taken in the wake of the Rio+20 Conference (see Part IV of the publication).

Table 1. Framework for measuring sustainable development: relationship between the conceptual and thematic categorisations

Themes	Dimensions		
	Human well-being ('Here and now')	**Capital ('Later')**	**Transboundary impacts ('Elsewhere')**
TH1. Subjective well-being	X		
TH2. Consumption and income	X		X
TH3. Nutrition	X		
TH4. Health	X	X	
TH5. Labour	X	X	X
TH6. Education	X	X	
TH7. Housing	X		
TH8. Leisure	X		
TH9. Physical safety	X		
TH10. Land and ecosystems	X	X	X
TH11. Water	X	X	X
TH12. Air quality	X	X	
TH13. Climate		X	X
TH14. Energy resources		X	X
TH15. Non-energy resources		X	X
TH16. Trust	X	X	
TH17. Institutions	X	X	X
TH18. Physical capital		X	X
TH19. Knowledge capital		X	X
TH20. Financial capital		X	X
Economic capital - monetary		X-*M*	
Natural capital - monetary		X-*M*	
Human capital - monetary		X-*M*	
Social capital - monetary		X-*M*	

Monetisation

27. Economic, natural, human and social capital can be measured both in physical and monetary terms. The issues related to monetisation of different types of capital are discussed. For some capital stocks, monetisation methods are available within the realm of official statistics. Produced, financial capital and some natural resources are covered by the SNA 2008. The System of Environmental-Economic Accounting (SEEA) 2012 Central Framework covers a number of natural resources. The SEEA Experimental ecosystem accounting describes the approaches to monetisation of ecosystem services which is in an experimental stage.

28. The publication is cautious on the use of monetisation because of the assumptions involved with respect to future extraction rates, discount factors, and the estimation of implicit prices for stocks for which there is no market. Variation of these assumptions can often affect the outcome significantly. Capital indicators that can be measured in monetary terms are marked with 'M' in Table 1.

Introducing the two large sets

29. 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 with economic theory and is therefore more amenable to economic modelling and to developing satellite accounts. Another advantage of the conceptual categorisation is that it identifies all important aspects of sustainable development which *should* be measured, and can therefore be helpful in identifying data gaps.

30. The advantages of the thematic categorisation are that the terminology is more suited to the language of the policymakers and the general public. In addition, the framework can easily incorporate indicators on the key 'policy drivers' for each theme. The policy drivers are a useful tool for policymakers as they can provide more detailed information on how to reverse negative or sustain positive trends.

31. The publication does not aim to define a one-size-fits-all approach, but rather presents a flexible framework that can respond to a variety of needs. Users who want to stress the current as well as the future aspects of human well-being (the 'integrated approach'), can base their indicator system on the twenty themes. Those who want to emphasise the intergenerational aspects of sustainable development (the 'future-oriented' or 'capital approach') can restrict themselves to the use of capital indicators. Within the future-oriented approach, some users may prefer to use monetised capital indicators (the 'monetary capital approach') shown in the last four rows of Table 1. Others may opt for the 'hybrid capital approach' that uses capital indicators in both monetary and physical terms.

32. The different approaches to constructing an SDI set have been linked on the basis of the flexible framework. The relationship between the conceptual and thematic categorisations is shown in Table 1.

Selection procedure for the two large indicator sets

33. The following three considerations were 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 methods described in the academic 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 V of the publication 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. Table 2 presents the indicators included in the two large sets. The indicators in the conceptual categorisation are provided in columns 2-4. The large set according to thematic categorisation includes the same indicators as the conceptual categorisation, and additional indicators (in column 5) that are used to measure the 'policy drivers'. A distinction can be made between different types of 'policy drivers', such as indicators on investment, depreciation, productivity and intensity. The publication contains more details on the different types of indicators. The indicators marked with 'Distr.' are aimed to measure distribution among different population groups (according to gender, age, etc.). The four indicators in the last row of the table are monetary capital indicators.

35. Some of the indicators in the table are 'placeholders' showing that the indicator is not yet available. The placeholders demonstrate a need for new indicators that statisticians can strive to develop in the future. Several of these placeholders are indicators that are expected to be developed as a result of the application of the SNA and SEEA standards. Other placeholders include footprint indicators as well as indicators related to inequality.

Table 2. The framework for measuring sustainable development: indicators

Themes (1)	**Thematic categorisation**			
	Conceptual categorisation (dimensions)			
	Human well-being ('Here and now') (2)	**Capital ('Later') (3)**	**Transboundary impacts ('Elsewhere') (4)**	**Policy drivers (5)**
TH1. Subjective well-being	Life satisfaction			
TH2. Consumption and income	Final consumption expenditure; Distr: Income inequality; gender pay gap		Official Development Assistance (ODA); Imports from developing countries	GDP per capita; Labour productivity
TH3. Nutrition	Obesity prevalence			
TH4. Health	Life expectancy at birth; Distr: Distribution-health	Life expectancy at birth Distr: Distribution-health		Healthy life expectancy at birth; Suicide death rate; Health expenditures; Smoking prevalence
TH5. Labour	Employment rate Distr: Female employment rate, Youth employment rate	Employment rate Distr: Female employment rate, Youth employment rate	Migration of human capital	Hours worked; Average exit age from labour market
TH6. Education	Educational attainment; Distr: Distribution-education	Educational attainment Distr: Distribution-education		Expenditures on education; Competencies; Early school leavers; Lifelong learning
TH7. Housing	Living without housing deprivation			Housing stock Investment in housing; Housing affordability
TH8. Leisure	Leisure time			
TH9. Physical safety	Death by assault/homicide rate			Expenditures on safety
TH10. Land and ecosystems	Land assets Bird index	Land assets Bird index	Land footprint (foreign part)	Protected areas; Nutrient balance; Emissions to soil; Threatened species
TH11. Water	Water quality index	Water resources	Water footprint (foreign part)	Water abstractions; Emissions to water
TH12. Air quality	Urban exposure to particulate matter	Urban exposure to particulate matter		Emissions of particulate matter; Urban exposure to ozone; Emissions of ozone precursors; Emissions of acidifying substances
TH13. Climate		Global CO_2 concentration; State of the ozone layer	Carbon footprint (foreign part)	Historical CO_2 emissions; GHG-emissions; GHG-emissions intensity; CFC emissions
TH14. Energy resources		Energy resources	Imports of energy resources	Energy consumption; Energy intensity; Renewable energy
TH15. Non-energy resources		Non-energy resources	Imports of non-energy resources	Domestic material consumption; Resource productivity; Generation of waste; Recycling rate
TH16. Trust	Generalised trust; Bridging social capital	Generalised trust; Bridging social capital		Contact with family and friends; Participation in voluntary work
TH17. Institutions	Voter turnout Distr: Percentage of women in parliament	Voter turnout Distr: Percentage of women in parliament	Contribution to international institutions	
TH18. Physical capital		Physical capital stock	Exports of physical capital	Gross capital formation
TH19. Knowledge capital		Knowledge capital stock	Exports of knowledge capital	R&D expenditures; Knowledge spillovers
TH20. Financial capital		Assets minus liabilities	Foreign Direct Investment (FDI)	Consolidated government debt; Current deficit/surplus; Pension entitlements
Context				*Size of population*
Monetary aggregates		*Economic capital, Natural capita, Human capital, Social capital*		

Selection procedure for the small indicator set

36. A smaller set of indicators is needed to communicate the main messages to policy makers and the general public more efficiently. Table 3 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). Population is added as a context indicator.

Table 3. Sustainable development indicators: small set – thematic categorisation (24 indicators)

Theme	**Indicator**
TH1. Subjective well-being	Life satisfaction
TH2. Consumption and income	Final consumption expenditure
	Official Development Assistance (ODA)
	Imports from developing countries
	Income inequality
	Gender pay gap
TH3. Nutrition	Obesity prevalence
TH4. Health	Life expectancy at birth
TH5. Labour	Employment rate
TH6. Education	Educational attainment
TH7. Housing	Living without housing deprivation
TH8. Leisure	Leisure time
TH9. Physical safety	Death by assault/homicide rate
TH10. Land and ecosystems	Bird index
TH11. Water	Water abstractions
TH12. Air quality	Urban exposure to particulate matter
TH13. Climate	GHG-emissions
TH14. Energy resources	Energy consumption
TH15.Non-energy resources	Domestic material consumption
TH16. Trust	Generalised trust
TH17. Institutions	Voter turnout
TH18. Physical capital	Gross capital formation
TH19. Knowledge capital	R&D expenditures
TH20. Financial capital	Consolidated government debt
Context indicator	*Size of population*

Availability of data in existing international databases

37. The mandate of the Task Force included an analysis of the indicators from the point of view of data availability within official statistics. The availability of data for the selected indicators for 46 countries (EU and OECD member countries and Brazil, Russia, India, Indonesia, China, and South Africa) in international databases was analysed to obtain a general estimate of how many of the proposed indicators are available within the databases of major international organisations.

38. Table 4 summarises to what extent the suggested indicators are available in the existing international databases. The indicators are divided into three categories: (i) data that are currently available in the databases of the United Nations and Eurostat, (ii) data available from other sources such as the OECD and the European Social Survey, and (iii) indicators as placeholders (i.e. indicators that are not yet available).

Table 4. 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%
- UN/Eurostat databases	73%	42%	50%	55%	69%	92%
- Other (OECD, World Bank, European Social Survey, National Oceanic and Atmospheric Administration, NASA)	9%	23%	0%	13%	7%	8%
Placeholders	18%	35%	50%	32%	24%	0%
Official statistics and placeholders from SEEA/SNA	73%	58%	50%	62%	80%	92%

39. Most indicators in the large sets (55% - conceptual categorisation, and 69% - thematic categorisation) and almost all (92%) indicators in the small set are available in the United Nations and Eurostat databases.

40. The availability is even greater if the scope of data sources is broadened to include the OECD, World Bank, European Social Survey, as well as climate-related sources (the US National Oceanic and Atmospheric Administration and the US National Aeronautics and Space Administration (NASA)).

Official statistics

41. Official statistics concern all statistical activities 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. Data available from outside official statistics are not necessarily of lower quality: some data sources pay significant attention to quality and have strict procedures to verify the data. However, their quality criteria differ from those applied by national statistical offices and international organisations producing official statistics. Furthermore, the procedures of collecting, producing and disseminating data may also differ from those used in official statistics. For example, there may be no obligation to protect data confidentiality, some stakeholders may have privileged access to the data, or there are no adequate procedures to guarantee independence and impartiality.

42. The analysis of data availability shown in Table 4 is largely based on official international statistical sources. The results show that many of the indicators are available in the datasets 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 can 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 advancing in measuring sustainable development. However, there are areas in which further development of indicators is needed, as outlined below.

The Way Forward (Part IV of the publication)

44. Part IV of the publication outlines potential areas for future work: (i) measurement issues; (ii) communication and visualisation of the data and (iii) the ways in which the outcomes of the Task Force's work may contribute to the post Rio+20 policy agenda.

Refining, extending and implementing the measurement system

45. The publication identifies a number of measurement issues related to the refinement, extension and implementation of the proposed measurement system:

(a) *Harmonising indicator sets for measuring sustainable development.* There is a great need for national statistical agencies and international organisations to harmonise their SDI sets so that they are better suited to international comparison. The framework may serve as a basis for further harmonisation. This work could be done in a second phase to take into account the SDGs and the related targets and indicators.

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

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

- Human, social, financial and natural capital. The measurement of these capital stocks and the wider availability of the related indicators need to be stimulated.
- Distribution. Income inequality measures need to be improved and augmented by comparable statistics on distribution 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 of human well-being to objective measures (e.g., measure of the prevalence of disabilities and chronic illness linked to how people perceive their health).

(e) *Measuring sustainable development at different scale levels*. Attempts should be made to measure sustainable development at other levels than that of countries, i.e. local, regional, enterprise (Corporate Social Responsibility) and household levels.

(f) *Satellite accounts*. The possibilities of introducing satellite accounts for the other domains of sustainable development, in addition to environment should be explored. This will improve the consistency between indicators and will ensure that indicators going 'beyond GDP' are produced using the same concepts as those related to the measurement of GDP.

Communication and visualisation

46. A proper communication of the SDIs to a broad audience is crucial. The last part of the publication reflects on the issues of communication and visualisation.

Post Rio+20 agenda

47. Part IV of the publication explores the possibilities of linking the work of the Task Force to important ongoing global policy initiatives such as the Millennium Development Goals, as well as the establishment of sustainable development goals (SDGs) as part of the post Rio+20 policy agenda. Section 9.3 investigates to what extent the potential indicator sets may be relevant in a global context. The research into the availability of data at a global level shows that the construction of global datasets is feasible. Table 5 presents a proposal for a 'global' small set.

48. Most indicators in this set are available for a large number of countries. Furthermore, the indicators of the Millennium Development Goals complement well the 'global' small set, as shown in Table 5.

49. In the post Rio+20 policy context, a strong cooperation between the statistical community and policymakers remains essential when formulating the SDGs and constructing global sets of sustainable development indicators. The framework is expected to contribute to setting up the goals and targets in such a way that they can be measured. Once the SDGs are defined, the indicators suggested in this publication can be aligned with the goals and the respective targets.

Table 5. Small set of indicators - global coverage and the link to MDG indicators

Theme	Indicator	Alternative indicator worldwide	Worldwide availability (no. of countries)	Source	**Relevant MDG indicators** (codes refer to the list of MDG indicators in Annex X)
TH1. Subjective well-being	Life satisfaction		135	World Happiness Database	
TH2. Consumption and income	Final consumption expenditure		210	United Nations	***1.4***
	Official Development Assistance (ODA) paid	Official Development Assistance (ODA) received	143	World Bank	***8.1-8.5; 8.9***
	Imports from developing countries	*Not relevant*	-	-	
	Income inequality	Share of poorest quintile in national consumption	134	United Nations (MDG database)	***1.1; 1.2; 1.3; 1.6***
	Gender pay gap		68	United Nations	***3.1- 3.3***
TH3. Nutrition	Obesity prevalence	Malnutrition prevalence	160	United Nations	***1.8; 1.9***
TH4. Health	Life expectancy at birth		185	United Nations	***4.1- 4.3; 5.1-5.6; 6.1-6.10; 7.9***
TH5. Labour	Employment rate		145	United Nations	***1.5; 1.7***
TH6. Education	Educational attainment		184	United Nations	***2.1-2.3***
TH7. Housing	Living without housing deprivation	Urban population in slums	91	United Nations (MDG database)	***7.10***
TH8. Leisure	Leisure time		20	Multinational Time Use Survey Database	
TH9. Physical safety	Death by assault/homicide rate		186	United Nations	
TH10. Land and ecosystems	Bird index	Bird species threatened	214	World Bank (WDI)	***7.1; 7.6, 7.7***
TH11. Water	Water abstractions		93	United Nations	***7.4-7.6; 7.8***
TH12. Air quality	Urban exposure to particulate matter		173	United Nations	
TH13. Climate	GHG-emissions	CO_2-emissions	229	World Bank	***7.2; 7.3***
TH14. Energy resources	Energy consumption		187	United Nations	
TH15. Non-energy resources	Domestic material consumption		200	Sustainable Europe Research Institute	
TH16. Trust	Generalised trust	Public sector management (University of Calgary, Canada, Centre for Public Interest Accounting)	82	World Bank (World Development Indicators)	
TH17. Institutions	Voter turnout		194	International Institute for Democracy and Electoral Assistance	
TH18. Physical capital	Gross capital formation		156	United Nations	
TH19. Knowledge capital	R&D expenditures		116	United Nations	
TH20. Financial capital	Consolidated government debt		84	World Bank (World Development Indicators)	***8.10***

LIST OF ABBREVIATIONS

BOD	Biochemical oxygen demand
CDIAC	Carbon dioxide information analysis center
CBS	Statistics Netherlands
CES	Conference of European Statisticians
ESS	European Social Survey
EU	European Union
EU27	The 27 member countries of the European Union
GDP	Gross Domestic Product
HDI	Human development index
HPI	Happy planet index
INSEE	National Institute of Statistics and Economic Studies of France (Institut national de statistiques et études économiques)
ISEW	Index of sustainable economic welfare
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
PISA	OECD programme for international student assessment
R&D	Research and development
SDI	Sustainable development indicators
SEEA	System of Environmental-Economic accounting
SNI	Sustainable national income
SNA	System of National Accounts
SSI	Sustainable Society Index
TFSD	UNECE/Eurostat/OECD Task Force for Measuring Sustainable Development
UN	United Nations
UNCED	United Nations Conference on Environment and Development
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

TASK FORCE ON MEASURING SUSTAINABLE DEVELOPMENT - MANDATE AND ORGANISATION OF WORK

50. The joint UNECE/Eurostat/OECD 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[3].

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

52. 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 it 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 monetisation 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.

53. 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 include the intra-generational aspects of sustainable development (i.e. to consider 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.

54. 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 and supranational organisations (OECD, European Commission (Eurostat), World Bank, the United Nations Commission for Sustainable Development and UNECE) participated in the work.

55. The following members of the task force and other contributors attended at least one TFSD meeting, and/or contributed to the text of the publication and/or worked on one of the issue papers (in alphabetical order): Pat Adams (Canada), Michael Bordt (Canada), Matthias Bruckner (UN CSD), Frode Brunvoll (Norway), Torstein Bye (Norway), Barbara Fraumeni (United States), Mads

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

Greaker (Norway), Wulong Gu (Canada), Gemma Van Halderen (Australia), Stephen Hall (United Kingdom), Liisa-Maija Harju (UN CSD), Kazi Islam (Canada), Robert Kornfeld (United States), Glenn Marie Lange (World Bank), Graham Lock (Eurostat), Branko Milicevic (UN CSD), Rachael Milicich (New Zealand), Marco Mira d'Ercole (OECD), Thorvald Moe (Norway), André de Montmollin (Switzerland), Frederic Nauroy (France), Francoise Nirascou (France), Claire Plateau (France), Jason Russo (Australia), Andrea Scheller (Eurostat), Joachim Thomas (Germany), Vincent Tronet (Eurostat), Oliver Zwirner (European Commission).

56. Rutger Hoekstra and Jan Pieter Smits of Statistics Netherlands shared the position of Chair and Editor of the Task Force. Lidia Bratanova, Tiina Luige and Vania Etropolska of the UNECE provided the secretariat. Lieneke Hoeksma of Statistics Netherlands provided language editing support.

57. The Task Force met three times in Geneva during its mandate: 16-17 September 2009; 18-19 November 2010; and 19-20 May 2011. A wiki was used for virtual discussions. The Task Force members prepared thirteen issue papers on which the publication 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 in different phases of developing the framework and indicators were held with the CES Bureau in January/February 2011 and November 2012, and with all CES members in March 2011 and June 2012. The full text of the publication was consulted with all CES members in December 2012-January 2013. The CES and its Bureau expressed support for the work throughout the process and provided many concrete suggestions for improvement. The comments by countries and organisations received during the consultations are taken into account in the current, updated version of the publication.

58. 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 on measuring progress, well-being and sustainable development (Eurostat and 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 for and took on-board the main outcomes of these initiatives. Furthermore, the Task Force benefited from the fact that a number of its members also participate in other initiatives.

59. The present publication provides an overview of the measurement issues and, where possible, advances them. It presents a thorough screening of existing datasets on sustainable development, focusing on the commonalities between the various approaches. Based on the measurement theory and data availability, it proposes a set of sustainable development indicators. This 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 improving well-being in one country 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'.

60. 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 quantify the fundamental trade-offs better (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 organisations. In order to increase the practical utility of the Report, a heavy emphasis is placed on the data availability;

(e) The framework distinguishes between core indicators and 'policy drivers' 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 TFSD 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.

Framework and suggested indicators to measure sustainable development

61. The publication consists of four parts.

62. 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 the three dimensions of sustainable development: the human well-being 'here and now', 'later' and 'elsewhere'. Special attention is paid to distributional issues.

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

64. 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. In particular, Annex VII presents the data availability for the potential indicators suggested by the Task Force for 46 countries.

65. 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. Part IV concludes by describing how the work of the Task Force might fit in the policy initiatives undertaken in the wake of the Rio+20 Summit.

66. Readers interested in how sustainable development is conceptualised can focus on Part I. Part II of the publication is the most technical and centres on identifying the sustainable development themes and related measurement issues. For those interested in developing an SDI set, Part III contains the most useful information by presenting a list of possible sustainable development indicators.

PART I. CONCEPTUAL BACKGROUND

67. Part I develops a conceptual framework for sustainable development. It consists of three chapters.

68. Chapter 1 identifies the basic concepts and definitions which are used in the remainder of the publication.

69. 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.

70. Lastly, 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 three dimensions of sustainable development: the human well-being 'here and now', 'later' and 'elsewhere'.

CHAPTER 1. INTRODUCTION

1.1. Background

71. There is a 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 on among other things the depletion of natural resources, climate change and so on.

72. The present publication 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 indicator 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 of its own citizens may affect the well-being of the citizens of other countries are discussed in depth. Lastly, the publication analyses the results of an extensive screening of existing datasets with sustainable development indicators, focusing on the commonalities between the various approaches.

73. 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 (e.g. 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

74. The Brundtland definition of sustainable development is taken as a starting point. This 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).

75. 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 the publication, such as sustainable development, human well-being, and capital and to describe how they are linked.

76. The Brundtland 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]".[4] These needs will not be met if the benefits and burdens (rights, responsibilities, risks, capabilities, access to goods, services and opportunities) are unfairly allocated among members of a given generation.[5]

[4] To a large extent sustainable development can be seen in terms of distributional justice. However, also total demand (i.e. the ways in which the world's population is able to meet its "needs" and "wants" is important).

[5] The extent to which these 'needs' are met indicates the level of human well-being. But human well-being depends not only on (basic) 'needs': the extent to which the 'wants' or preferences of people are met, is also important when assessing well-being. However, the Brundtland report, with its strong focus on global poverty issues, strongly addressed the needs. It should be noted that 'poverty' is not a separate theme, but rather a cross-cutting issue. Poverty can be tracked with the help of distributional statistics presented in this publication.

77. 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, the publication also stresses the importance of assessing distributional issues *within* countries. The distribution of well-being between countries is referred to in the publication 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. The publication does not make any assumptions about linking economic growth and sustainability. The presented measurement system is neutral from this viewpoint. Users can find out whether there is a correlation between economic growth and sustainable development by comparing the sustainable development indicators with economic data.

78. Chapter 2 of the publication presents different perspectives on sustainable development. Some approaches take into account only relevant inter-generational aspects and focus on the human well-being of future generations, whereas others also include the human well-being of the present generation. The measurement system proposed by the Task Force addresses both issues. Users who prefer an integrated view on sustainable development can use all proposed indicators, while those who would rather stress future aspects can use a sub-selection of indicators relevant to assess whether enough resources are left for future generations. The measurement system consists of dashboards on human well-being "here and now", "later" (measured on the basis of capital) and "elsewhere" (focusing on the ways in which countries impact the rest of the world).[6]

Capital and human well-being

79. The well-being of present and future generations crucially depends on how society uses its resources. 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 (e.g., 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, guidelines on how to measure these stocks are laid down in statistical handbooks such as the System of National Accounts (SNA) and the System of Environmental-Economic Accounting (SEEA). Figure 1.1 shows how human well-being is related to the resources (the different types of capital) that underpin it.

80. 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 focuses exclusively on the command 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 their needs are truly satisfied. This perspective relates to the 'functioning and capabilities' stressed by Amartya Sen (Sen 1993, 2000). Sen's approach emphasises the importance of freedom: the more freedom people have, the larger their range of 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.

81. 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). This publication presents indicators for all these different types of capital. Therefore, no a priori assumptions regarding the substitutability of assets are built into the indicator system. Figure 1.1 presents a simplified representation of the relationship between the concepts of capital and human well-being A more elaborate analysis of how capital enhances human well-being is provided in Chapter 3.

[6] A similar typology can be found in the German Sustainability Report (Progress Report on the National Strategy for Sustainable Development, 2008). Here four guiding principles can be discerned: (inter-) generational justice, quality of life, social cohesion and international responsibility.

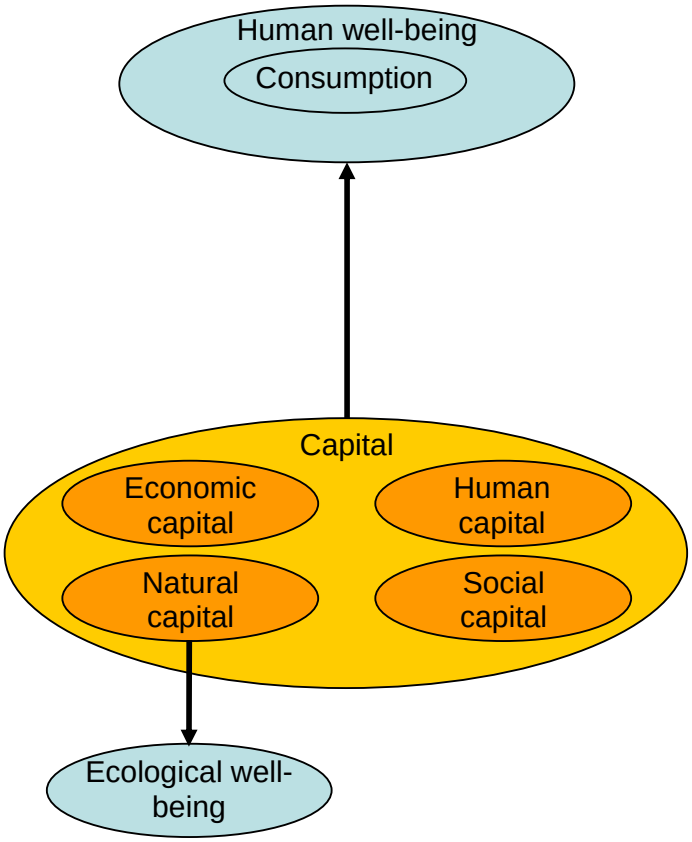

Figure 1.1. Capital and human well-being

The following definitions are used in the report:

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Human well-being: A broad concept which is not confined to the utility derived from the consumption of goods and services, but 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 consumption expenditure.
Capital: A stock or resource from which revenue or yield can be extracted. Originally capital was seen as strictly physical, man-made capital (such as machinery and equipment, buildings and infrastructure). Gradually, the capital concept has been broadened to include 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.

82. The discussion on sustainable development often emphasises the special nature of natural capital. Without natural capital humanity could not survive. This approach to natural capital is anthropocentric, as natural capital is only considered of value if it provides ecological services for 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. Note that in this figure, the various capital forms are graphically represented as being a similar size. This does not symbolise their relative importance. Some argue that natural capital is the broadest and most important asset, and that the other capital stocks (and human existence) are a sub-set of the ecological system.

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

83. 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 for future generations a level of human well-being at least equal to that prevailing today. A necessary condition for this is that the per capita stock of wealth is non-declining, which requires replacement or conservation of the elements of that wealth (i.e. stock of economic, natural, human and social capital).

84. 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 organisation could allow for efficiency gains in the use of resources. In addition, we do not know how the population will grow or what people will want to consume and in what quantities. Therefore, the only way to monitor to which extent today's society is on a sustainable path is by monitoring the volume of assets and thus establishing whether resources are being preserved for future generations. At the same time, the population dynamics is a vital element of sustainable development and should be taken into account.

85. Figure 1.2 introduces the time dimension: 'now' versus 'later'. It shows that, by way of the production process, different capital stocks lead to the production of both goods and services that are consumed by people, and other personal attributes (e.g. health, education) which generate human well-being. Capital stocks 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.

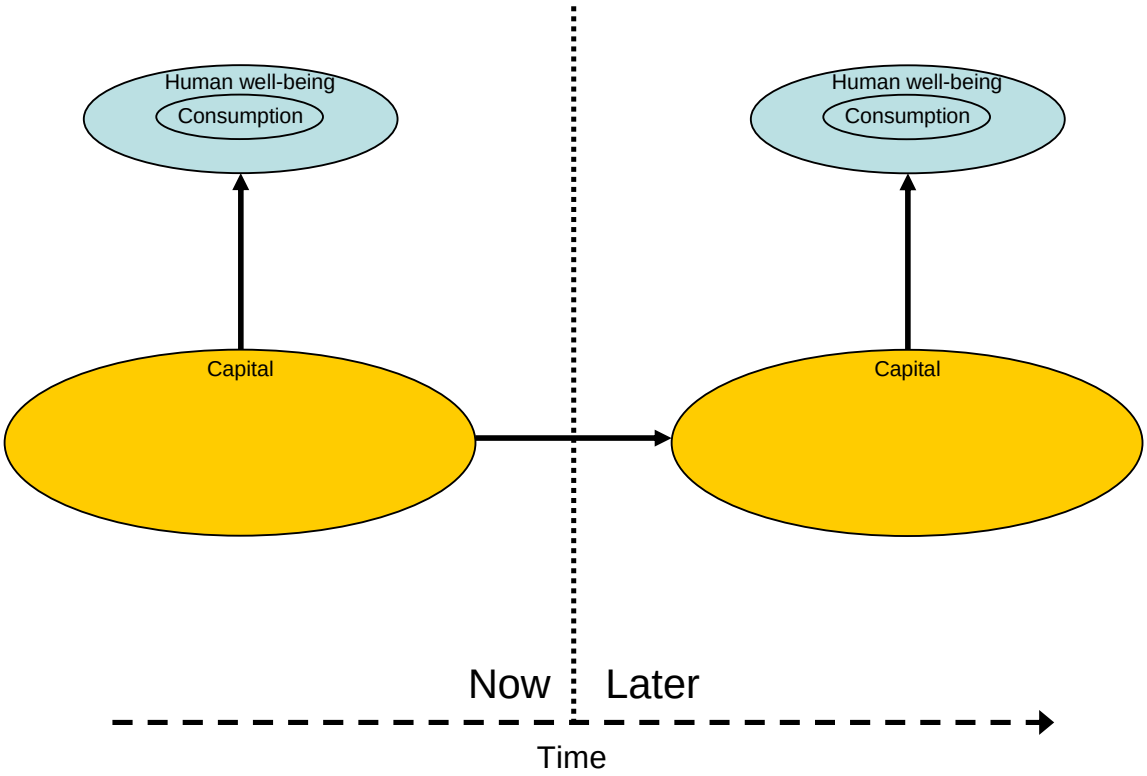

Figure 1.2. Sustainable development: 'now' versus 'later'

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

86. The capital approach is linked 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.

87. In building up human well-being, a nation can use its own resources, but it 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 on the natural capital available in others and in a global perspective. A country's human well-being can be affected by imports and exports of economic capital (machinery and equipment), as well as by imports and exports of human capital (e.g. through the transfer of knowledge associated with migration).

88. 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'.

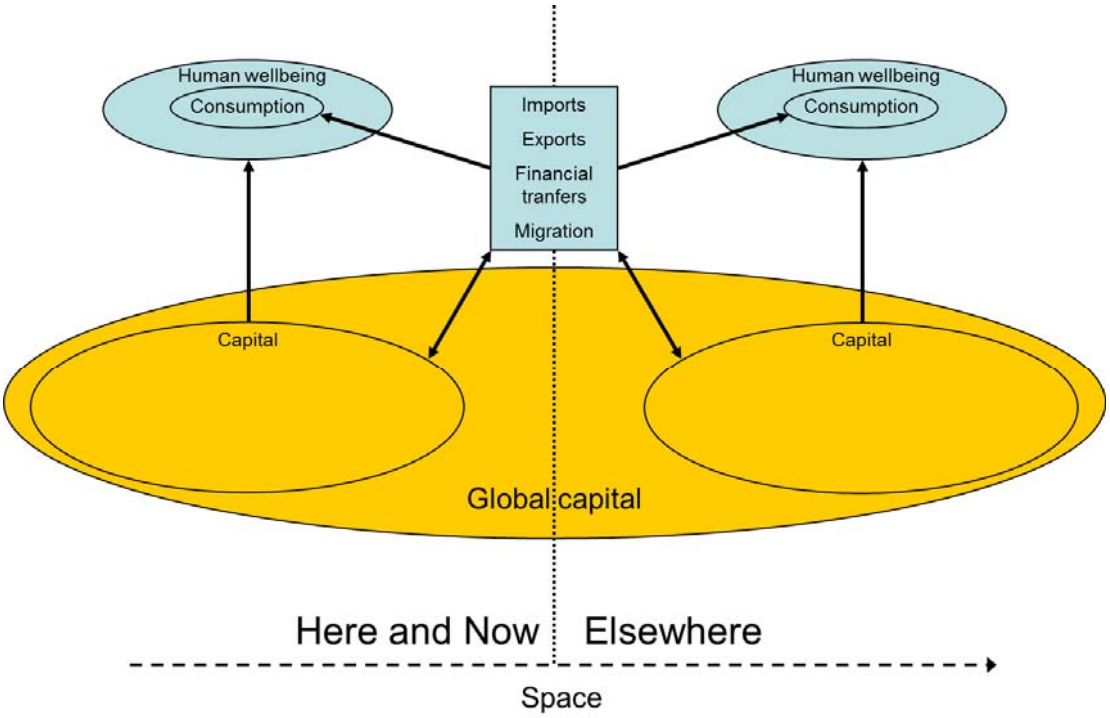

Figure 1.3. Sustainable development: 'here' versus 'elsewhere'

CHAPTER 2. PERSPECTIVES ON SUSTAINABLE DEVELOPMENT

89. This chapter presents a brief overview of existing approaches used to measure 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. Lastly, 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

90. 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 a historical overview of the literature in this field to ensure a better understanding of the current measurement efforts and debates.

2.1.1. Measurement of the economy

91. Measurement of the economy goes back many centuries[7], but the modern version has 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).

92. "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)[8]. The latest 2008 revision reinforces the status of the SNA as one of the most important statistical standards to date (SNA, 2008).

93. Since its inception, the SNA has received criticism for what it measures and what it does not (for an overview of arguments, see Van den Bergh, 2009). Some very fundamental debates and disagreements even preceded 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.[9,10]

94. The SNA has proven to be one of the most successful statistical innovations in history, yielding influential indicators such as GDP. Estimates of GDP are produced by nearly every country in the world and for very long time periods (Maddison, 2001).

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[7] 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.

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

[9] 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.

[10] 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.

2.1.2. Pre-Brundtland period: economic composite indicators

95. In the 1950s and 1960s an influential environmental movement emerged 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'[11]. In parallel to this development, the criticism of macroeconomic measures such as GDP, which do not incorporate environmental or other external effects, also increased.

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

97. Accounting for environmental aspects came somewhat later and was stimulated by two events in 1972: the Club of Rome's *Limits to growth* report was published, presenting a Malthusian confrontation of limited resources on the one hand 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.

98. 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).

99. The initial composite indicators were very much academic products. Although some of them did receive attention in statistical and policy circles, none managed to become the 'official' alternative for GDP.

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

100. 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)[12]. The report is often referred to as the Brundtland Report, after Gro Harlem Brundtland, the chairperson of the WCED. The report was important in broadening the scope of sustainable development beyond environmental concerns to include social aspects at the national and international levels.

101. While the Brundtland report is usually credited with the conceptualisation of sustainable development, the United Nations conferences in Rio (1992) and Johannesburg (2002) both provided a major impetus to the measurement of sustainable development. The United Nations

[11] The notion of '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." However, he 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 yet been reached.

[12] 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.

established the Commission on Sustainable Development (CSD) in the early 1990s, which presented its first set of sustainable development indicators in 1993[13].

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

103. Also from the end of the 1990s, several major international and supranational organisations such as the European Union, European Commission (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.

104. 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

105. 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).

106. 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-Economic Accounting 2012 (SEEA2012), which is a satellite account of the SNA, includes a number of macroeconomic 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 of official statistics.

107. Another type of composite indicators also emerged during this period, the roots of which do not lie in 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 and Wackernagel, 1994).[14] Other examples of composite indicators include the Happy Planet Index (HPI), the Sustainable Society Index (SSI) and the Living Planet Index (LPI).[15]

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

109. A third type of indicators 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 in their life (Kahneman and Kruger, 2006). Although these subjective measures have been discussed by economists since the 1970s (Easterlin, 1974), the field has gained considerable momentum in the last decade (Anielski, 2007 and Layard, 2011).

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

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

[15] 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.

Indicator sets

110. 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 one single measure, 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

111. The post-Brundtland era has been an extremely fruitful period in the theoretical and practical measurement of sustainable development. However, there seems to have been 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.

112. The lack of harmonisation is partly due to the fact that countries consider different aspects as being the 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 relate to differences in academic approaches and data availability.

113. It is important to note that some harmonisation initiatives in the field of measuring sustainable development are already taking place. The harmonisation process started in the early 1990s. In 1993, after extensive consultation with stakeholders, the United Nations Commission for Sustainable Development recommended a list of SDIs. This 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 intended more 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.

114. 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's Sponsorship Group for Measuring Progress, Well-Being and Sustainable Development (co-chaired by Eurostat and France-INSEE), was mandated to advance the implementation of the recommendations of the Stiglitz-Sen-Fitoussi report in the EU countries[16].

115. The work of the Task Force on 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 and supranational 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 in the field of comparing existing indicator sets and developing a common measurement framework provides an important basis for further harmonisation.

116. Whether greater harmonisation in the measurement of sustainable development will be realised will partly depend on the willingness of institutes to converge. Many organisations 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 experience (e.g. the processes of the SNA and SEEA) has shown that a

[16] For the ESS programme on Measuring Progress, Well-being and Sustainable development, see: http://epp.eurostat.ec.europa.eu/portal/page/portal/pgp_ess/about_ess/measuring_progress.

harmonisation process can take 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

117. This section discusses five areas of potential disagreement in the measurement of sustainable development Different answers to these key questions lead to different ways of measuring 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

118. 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 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[17].

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

120. There are a variety of conceptual approaches to choose from. One of these is the capital approach, which is prominent in the academic literature and was adopted in both the Stiglitz-Sen-Fitoussi and in the WGSSD reports. The capital approach is explained in more detail in Chapter 5 of the publication.

121. Another example of a conceptual approach is the MONET framework, developed in Switzerland (FSO 2012) and later modified and adopted by the statistical office of New Zealand (SNZ, 2011). 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.

122. 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 policymakers or the general public.

123. 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.

124. *The TFSD aimed to link the two approaches to allow flexibility in their implementation and make use of the advantages of both views. The publication therefore proposes a flexible conceptual*

[17] In the WGSSD report, these two approaches were called the 'conceptual' and the 'policy' approach. These terms are not used in the current publication 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 the publication.

framework, which takes on board the insights provided by the indicator sets based on extensive consultations with policymakers and other stakeholders.

2.3.2. Environmental or broad societal perspective

125. A large part of the literature on sustainable development focuses on environmental aspects. This has also led to initiatives which focus on the environmental dimension of sustainable development. Examples are concepts of the "green economy" (UNEP, 2011; 2012) and "green growth" (OECD, 2011). Recently effort has been made to harmonise this work (GGKP, 2013).

126. 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: the environmental dimension is an important component of sustainable development, but is only part of the broader concept.

127. *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

128. 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.

129. The integrated approach aims to reconcile explicitly the needs of present and future generations. 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 for attention to the fundamental trade-offs between human well-being 'here and now', 'elsewhere' and 'later'.

130. 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'.

131. 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.

132. The future-oriented 'capital approach' has a solid academic foundation. Another advantage of this 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 current well-being and many official statistics already exist to monitor these short-term developments: bringing together statistics concerned with the long-term development of society can therefore lead to new insights.

133. 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.

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

2.3.4. Monetisation

135. 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 knowledge capital (in the SNA) are currently calculated by many national statistical offices. These types of capital are covered by official statistical standards such as the SNA2008 and SEEA2012. 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.

136. 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 change of the total stock of capital (national wealth) allows a direct assessment of whether development is on a sustainable path or not.

137. One of the problems of monetisation is that, where available, it uses 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.[18]

138. 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.

139. 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.

140. *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 SEEA2012 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*

[18] 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 accurate 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).

others is presented later in the publication. No methods for monetisation for social capital have been developed so far.

2.3.5. Composite indicators or SDI sets

141. In the history of measuring sustainable development, one of the core differences between the alternative approaches relates to the choice between composite indicators and indicator sets. At present, nearly all international organisations 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.

142. *The TFSD puts forward a set of indicators because, from the standpoint of official statistics, there are 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'

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

144. 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 and the better they are managed in the 'here and now', the more capital is left for people elsewhere on the planet and for future generations.

145. 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).

146. The starting point of the framework for measuring sustainable development is therefore to distinguish between the 'now' and 'later' dimensions. This has already been 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 lives.

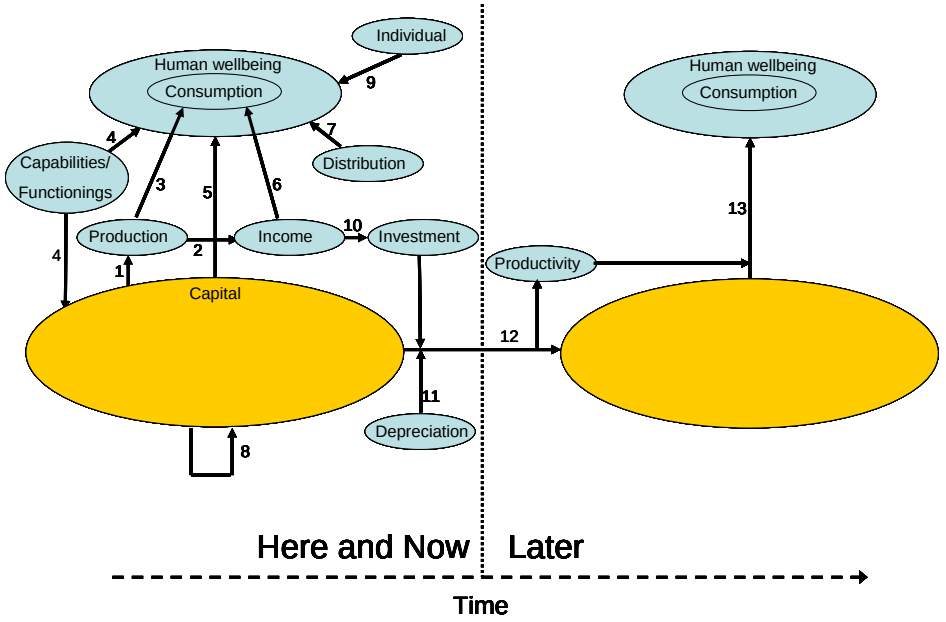

Figure 3.1. Sustainable development: 'now' versus 'later'

147. 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] Lastly, the goods and services produced are consumed by individuals, providing them with 'utility'. The sum of utilities from consumption across all persons is sometimes referred to as 'welfare' in economics, where it is common to model the preferences of individuals using a utility function.

148. The first three steps are common to the standard model in economics. The model needs to be expanded in a number of ways when 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 strongly emphasises these aspects in his work (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 positively correlates with 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, et al., 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, et al., 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 et al., 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 various capital stocks are interrelated but distinct from each other. Growth of one capital stock may 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] Lastly, well-being is not only affected by resources but also by individual psychological characteristics and availability of information (Zajonc, 1980; Argyle 1987; Bradburn, 1996; Lewin, 1996; Deneve and Cooper, 1998).

149. The discussion of Figure 3.1 illustrates that there are many mechanisms that influence human well-being. 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 (e.g. 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 in any given circumstance is limited by the decisions made in the past. The choices made by societies typically have long-term 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, they also impact on the well-being of the next generation.

[13] The effect of productivity changes should be mentioned. Due to efficiency gains, less capital may be needed in the future to generate the same amount of well-being 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'

150. In an ever globalising world sustainable development cannot 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[19].

151. Following the conceptual framework proposed in the publication, 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.

152. There are two caveats, however. 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. Furthermore, 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.

153. Secondly, the transboundary impact of one country on the rest of the world can be charted by focusing on how this country uses (non-renewable) sources from abroad and thus may harm the long-term well-being of the countries in question.

154. 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 publication as the 'transboundary impacts' of sustainable development. It is visualised in a similar way as in Figure 3.1.

155. 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.

[19] For a stimulating discussion of this growing inequality, see Pritchett (1997).

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

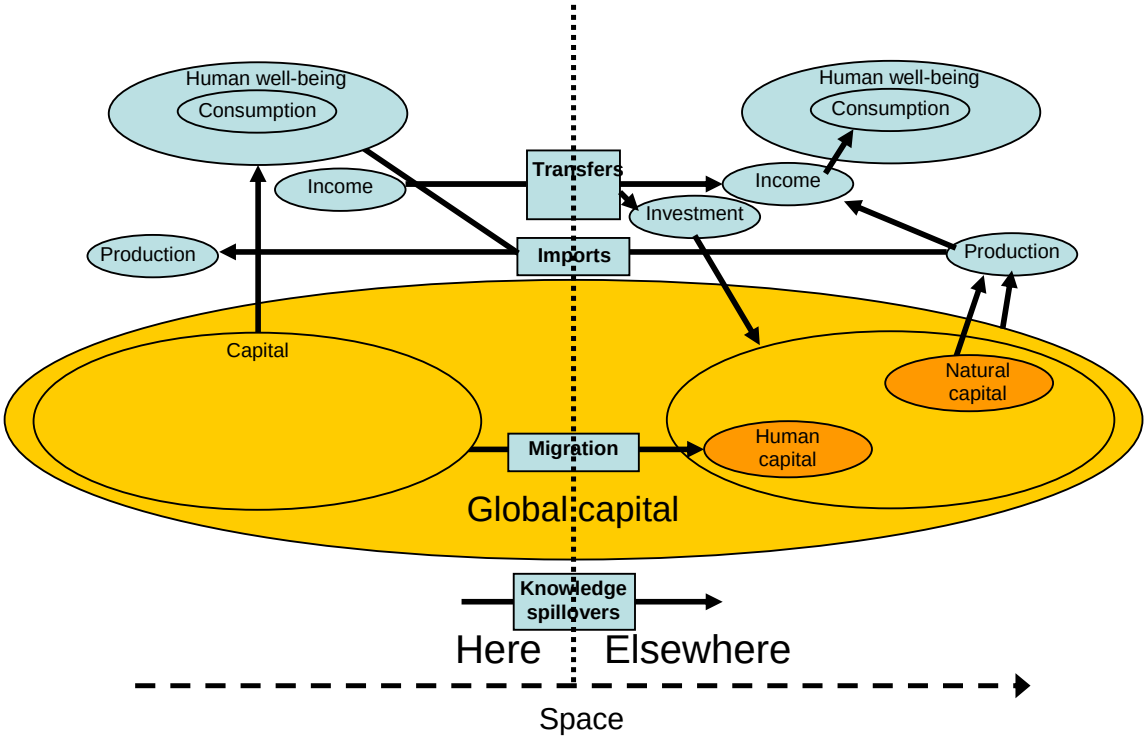

Figure 3.2. Sustainable development: 'here' versus 'elsewhere'

• *Financial flows/income transfers.* Money can be transferred from one nation to another, for humanitarian or developmental reasons (as in the case of Official Development Aid (ODA)), or to repatriate 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. Imports of commodities provide the importing country with goods and services for consumption or use in the production process. Conversely, exports of commodities provide 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. 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 hand, 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.

157. 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

158. Part II of the Report describes the measurement of human well-being and sustainable development on the basis of the 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

159. 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.) to describe 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 that the concept of human well-being be addressed using a comprehensive framework that combines the strengths of the various existing approaches. 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 an SDI set.

Welfarism

160. 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.

161. 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

162. 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 Oishi, 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 (e.g. in terms of life satisfaction, positive or negative emotions or 'affect' and eudaimonia[20]) 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, education 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, several national statistical offices have been developing indicators of subjective well-being through their own surveys (see for example Amiel et al, 2013), and the Stiglitz-Sen-Fitoussi Report has further stimulated interest in these measures. The OECD has developed guidelines for compilers and users of subjective well-being data (OECD, 2013), to encourage greater production of these data and increase their comparability.

163. The subjective well-being literature provides a positive shift away from the purely materialistic approach of traditional welfarism (focused on the commodities consumed by each person). The notion of subjective well-being is in itself complex. In particular, it is important to distinguish, conceptually, between what people think of their life (a cognitive evaluation, affected by memory and other circumstances) and how they evaluate various aspects of their life at the very moment they are experiencing them, even if it is not easy to disentangle these two aspects in practice.

[20] 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 worthwhileness, as well as feelings of competence, autonomy, resilience, interest in learning, goal orientation etc.

164. 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. He 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 recognise as important to them. Functionings can be interpreted as a series of achievements of each person, for example 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, he 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

165. 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.[21]

166. Following the recommendations of the Stiglitz-Sen-Fitoussi report, the measurement of both objective and subjective well-being should be included in 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).

167. 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:

(a) The UNDP Human Development Report presents the Human Development Index (HDI), which can be seen as an attempt to operationalise Sen's functionings and capabilities approach. It includes education, health and income as the primary dimensions.

(b) 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.

(c) The subjective well-being research by 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 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.

(d) Eurostat's Expert Group on quality of life indicators (building on the Eurostat's feasibility study, published March 2010[22]. These findings are in line with the recommendations of the Sponsorship group on Measuring Progress, Well-being and

[21] Maslow distinguishes the following human needs: food, water, clean air, safe neighbourhood, medical insurance, job security, financial reserves, friendship and belonging to a group. Moreover, 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).

[22] http://epp.eurostat.ec.europa.eu/portal/page/portal/gdp_and_beyond/achievements

Sustainable Development (an initiative of the European Commission (Eurostat) and the French Statistical Office (INSEE)).

(e) 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.

168. The result 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.[23] Nutrition is included as a separate theme as it is a basic need according to Maslow. Moreover, the inclusion of 'nutrition' is important as research into the well-being of developing countries clearly indicates the importance of this theme.

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

Themes	Human Development Report	Stiglitz-Sen-Fitoussi report[24]	Layard's big 7	Eurostat expert group on quality of life	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	X
Education	X	X		X	X
Housing					X
Leisure		X		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

169. Table 4.2 presents 14 themes that are considered relevant to the measurement of specific aspects of human well-being.

[23] In some of the studies, the themes mentioned in the left-hand column of Table 4.1 are somewhat differently labelled. In the Stiglitz-Sen-Fitoussi (SSF) 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 SSF 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 SSF report in terms of 'political voice and governance', and by Layard as 'personal freedom' (in terms of a democratic society).

[24] In the SSF Report the labour and housing themes are included in the category 'personal activities'.

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

170. 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.

171. 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.

172. 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 an SDI set.

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

5.2. Concepts and definitions

174. 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).

175. 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 Solow capital was defined in terms of economic capital and dealt with man-made assets which are of a physical nature, such as machinery, equipment and buildings.

176. GDP = *f*(Lab, Cap, Tech), where:

GDP: Gross Domestic Product;
Lab: Labour;
Cap: Economic Capital;
Tech: Level of technology

177. 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.

178. The production function is a useful way of thinking about economic growth in the long run. However, it only considers 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, the current publication 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. The publication uses a broader capital concept to account for the broad range of benefits which are relevant for human well-being and sustainable development.

179. 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.

180. The first addition to the production function was that of human capital, which focuses on the quality of labour (often measured in terms of workers' educational attainment). Today there is quite a range of 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).

181. 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-Economic Accounting (SEEA), which was adopted by the United Nations Statistical Commission in 2012, has bolstered the measurement of these sub-soil resources.

182. 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).

183. 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 asset of which investments can be cumulated into a stock measure.

5.3. Economic capital

5.3.1. Concepts and definitions

184. 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, the publication does not go into its measurement methodology in detail. Instead, a broad overview is given and references are provided where more details can be found.

185. 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 the Report presents the relationships between the categories of assets listed in the SNA and the categories of assets used in the framework.

186. 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 (i.e. inflation-adjusted) stocks and flows over time.

187. 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

188. 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: negative effects of economic production on the environment (externalities), for example.

5.3.3. Physical indicators and valuation

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

190. As mentioned above, in the 2008 edition of the SNA, the concept of economic capital has been broadened to include R&D expenditure, which was considered as intermediate consumption in the SNA 1993. In the SNA 2008, R&D expenditure is 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, 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).

191. 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 the current publication.

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 just to look 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, are important. The distributional aspects are important for two reasons:

- The position of each institutional sector (government, households, financial intermediaries and non-financial firms) should be considered separately. Even if, in a closed economy, the financial 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 (e.g. 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 homes, this may trigger a further decline of real estate prices, leading to a sustainability crisis.

192. 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.

5.3.4. Selection of themes

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

Table 5.1 Classification Economic capital

Dimension	Sub-dimension	Themes
Capital	Economic capital	EC1. Physical capital
		EC2. Knowledge capital
		EC3. Financial capital

5.4. Natural Capital

5.4.1 Concepts and definitions

194. Natural capital refers to all naturally occurring assets that have a direct or indirect impact on human well-being. The System of Environmental-Economic Accounting, 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).

195. 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 life of people and 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.

System of Environmental-Economic Accounting (SEEA)

196. The System of Environmental-Economic Accounting (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 follows an accounting structure similar to that of the System of National Accounts and uses concepts, definitions and classifications consistent with the SNA. More and more countries are adopting environmental accounts. In the European Union there is a legal obligation to keep a number of the accounts of the SEEA Central Framework (EEA Regulation).

197. The SEEA ecosystem accounts are still considered as being in an experimental stage. The ecosystem accounts are described in another volume of SEEA, which was not yet finalised at the time of preparing the current publication. The concept of ecosystem services is well known in the scientific community, but there is little practical experience in measuring the concept among official statisticians. The SEEA volume on ecosystem accounts describes best methods and practices and is not considered as an international standard.

Definition of natural capital in the SEEA

198. 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) *Land and Natural resources.* The SNA and SEEA define how these resources should be measured. These standards 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*[25]. 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 no international consensus yet on the measurement of ecosystems. Work is currently in progress on the definition of experimental ecosystem accounts in SEEA's *Experimental Ecosystem Accounting*. 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'[26].

(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 the current publication, the boundaries of natural capital are considered 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), the current publication 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).

5.4.2 The impact on human well-being

Natural resources

199. Natural resources are used for a variety of purposes in economic processes: to provide 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

200. 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 as 'goods' in other classifications), regulating services (processes that are essential to maintaining ecosystem function), habitat services (those that maintain biodiversity) and

[25] 'Biodiversity' is sometimes used interchangeably with 'ecosystems'. It can be understood as richness of species and for the purposes of the publication is considered as being a property of ecosystems.

[26] The precise definition of 'ecosystem' as a unit of statistical accounting is still under discussion. 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.

cultural services (those that humans find essential to their well-being, such as aesthetic and religious experience)[27]. Each of these four categories includes a number of subcategories detailed in Annex III (Table III.4).

201. 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).

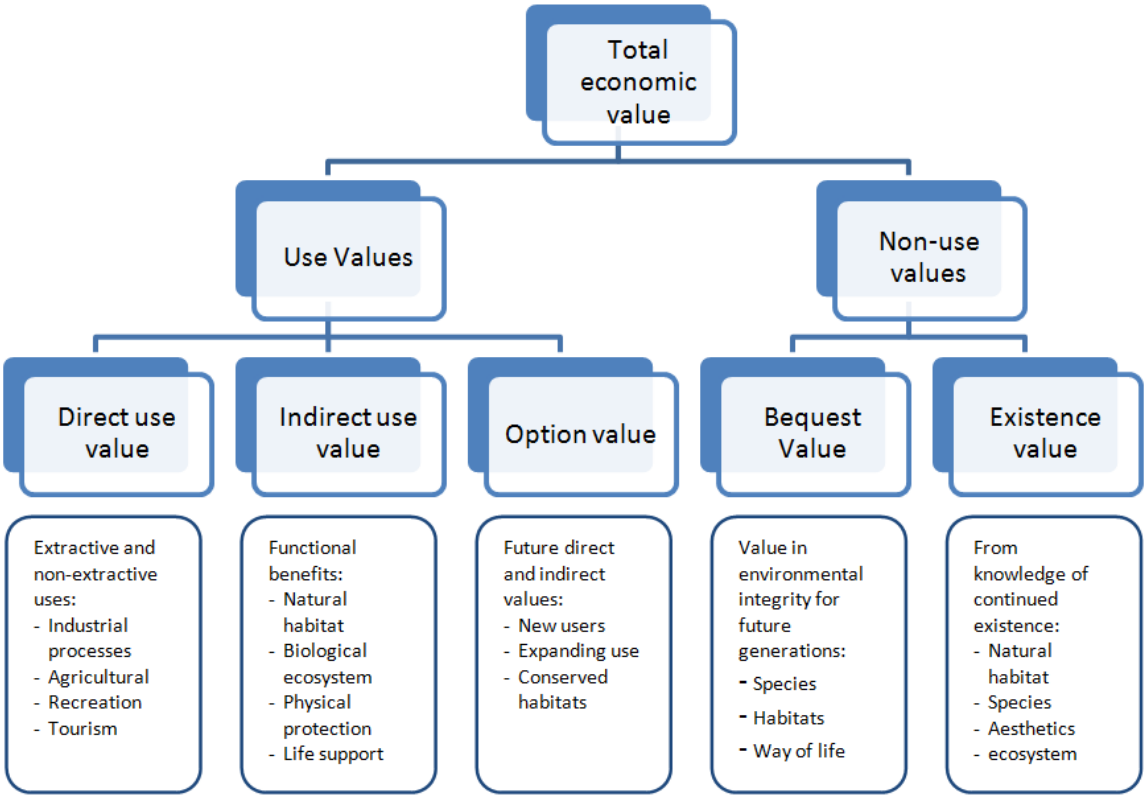

Figure 5.1. Economic values provided by an ecosystem (Total Economic Value – TEV) (Adapted from The Economics of Ecosystems and Biodiversity (TEEB), 2010)

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

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

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

[27] 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.

(d) *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.
(e) *Bequest values* are the values associated with assuring that natural resources are passed on to future generations.

Environmental conditions

The atmospheric system, whether it be 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 it provides. The ozone layer, for example, protects mankind from UV rays 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

204. 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.

205. 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. 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, favoured by the SEEA, is similar to that used for valuing an annuity: a resource's value is equated to the income flow that can be generated from extracting it over its useful lifetime. The first step to estimating the flow of income from the 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. In addition to these costs, 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.

206. 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. A final step in valuation is to calculate the present value of the income flow. 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

207. 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, land form, etc.) – and changes therein are used to define the 'statistical unit' or ecosystem.

(2) The quality of the ecosystem is evaluated based on biophysical data (species diversity, water quality, air quality, temperature, pH and levels of natural and artificial substances, etc.) attributed to the ecosystem[28]. 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. Based on quality measures, indices of biodiversity and resilience of ecosystem health can be derived.
(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. To obtain non-use values, environmental economists typically conduct surveys among 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.

208. Information on land use and land cover can be used to produce a number of valuable ecosystem-related indicators:

(a) *Change in land cover* can indicate the speed at which land cover is being altered by human activity — 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.
(b) *The presence of important land cover types* (e.g., 'virgin' forest, wetlands) can be tracked.
(c) *The proportion of area that is protected* can be determined.

209. Ideally, a national classification of ecosystems would be coherent with emerging international classifications. The TEEB classification shown in table III.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.

210. Methods exist and are being refined to measure the economic value of ecosystems based on use and non-use benefits. Figure 5.1 provides a summary of the current understanding of the services that ecosystems supply. The methods developed in environmental economics to determine use and non-use values 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).

211. Measures of ecosystem goods and services can be used in several ways. One way is to monetise the values and aggregate them into one 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, i.e. how the values would change under different conditions. For this reason, it is important to understand the relationship between the quality of the ecosystem and the value of its services. To maintain the flexibility to do both, it is useful to consider ecosystem goods and services in terms of both average and marginal values.[29]

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

[29] *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.

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 used for recreation. Assumes that the value of a site is reflected in how much people are willing to pay to travel to visit it.
- 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 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

212. There is very little agreement about the measurement of assets not covered by the SEEA Central Framework and the SEEA Experimental Ecosystem Accounting. It is beyond the scope of this publication 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.

213. 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.

214. Over the past two decades, many studies have tried to put a price on the damages caused by 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 tonne 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).

215. 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

216. The measurement of natural capital encounters many challenges. The current publication identifies a number of directions that need further exploration.

217. *Asset boundaries*. The current publication 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 the national territory are not considered as 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.

218. *Statistical units*. Any accounting system, including ecosystem accounts, requires a basic measurement unit that is defined consistently, can be classified in 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 is relatively stable over the accounting period.

219. *Critical natural capital/tipping points.* Monetary valuation of ecosystem accounts by TEV (Total Economic Value) 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.

220. A related topic concerns the so-called 'tipping points'. If 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.

221. *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 the publication).

- Attempts have been made to aggregate quantities of natural assets simply by adding their weight (e.g. adding tonnes of coal to tonnes of timber) to understand 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 monetisation of non-market assets (see sections 2.3.4 and 5.7 of the publication), and even accepted approaches (e.g. valuing minerals and metals in terms of the net present value of the income flow (resource rent) expected from them) require 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

222. The natural capital themes proposed in the framework for measuring sustainable development are shown in Table 5.2. It is important to note that the current publication adopts a broader definition of natural capital than the SEEA Central Framework. Some natural assets (energy resources, non-energy resources and water resources) are covered by the SEEA Central Framework, while ecosystems are covered by SEEA Experimental Ecosystem Accounting. Land is covered both by SNA and by the SEEA Central Framework. In addition, the sustainable development framework includes natural assets that are not covered in the SEEA, like air quality and climate. The relationship between the SEEA and the themes used in the sustainable development framework is 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

223. There are different definitions of human capital. The current publication relies on the definition proposed by the 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). In this context the notion of capital underscores the fact that the people's characteristics impact not only on current well-being but also on people's conditions in the future. 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).

224. Most accounts of human capital distinguish between people's skills and competencies (acquired in school and non-school settings) and their health conditions. For 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 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'.

225. Although 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

226. 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 education system contributes to human well-being in the future through higher per capita production and (multifactor) productivity. At the same time, education is also relevant for well-being today, as research has shown that persons with higher education levels enjoy higher levels of life satisfaction, better health, greater opportunities to socialise 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.[30]

5.5.3. Physical indicators and valuation

227. 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 people's highest attained level of education, and expressed in the form of either population shares having attained various educational levels (e.g. primary education, lower secondary education, upper secondary education, etc.) or continuous measures of the duration of schooling (i.e. measures of average years of schooling or measures of school life expectancy of students of a given age).

228. 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 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.

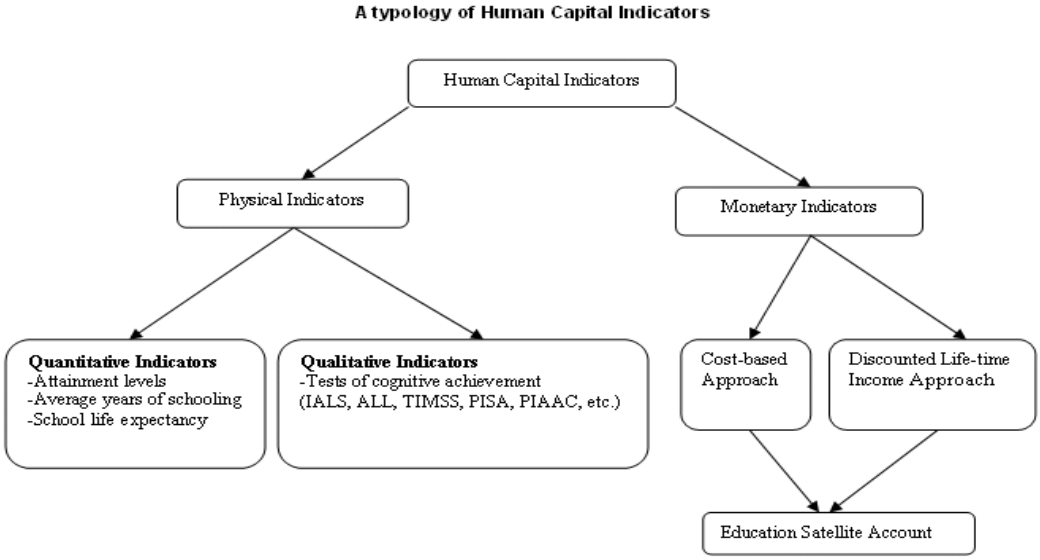

Figure 5.2 A typology of human capital indicators

229. The limits to physical indicators on education 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 the production of human capital (using the cost-based approach first implemented by Kendrick, 1961) or at the outputs that it generates (using the lifetime income approach pioneered by Jorgenson and Fraumeni, 1995). While these two approaches are typically considered as being opposites, they are two sides of the same coin and, in principle, both inputs and outputs should be included in a more comprehensive education satellite account with an education production function at its core.

[30] Also in inter-generational terms, there are subtle ways in which human capital can be transferred, as children's educational attainment strongly depends on that of their parents.

The Jorgenson-Fraumeni approach

230. The Jorgenson-Fraumeni methodology estimates human capital on the basis of 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, 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.

231. The lifetime income approach can be applied to market work (based on observed wages of people with different educational attainment levels) as well as to non-market activities (the time that people devote to care, housework, education or health-related activities) and leisure time. However, extending the approach to include non-market aspects requires 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 level of education. 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.

232. The various 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 (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 across countries. More recently overviews of country experiences in measuring human capital have been published (Boarini et al, 2012 and UNECE, 2013).

233. 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, if 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.

234. 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). Others are related to their interpretation, in particular to the possibility that they might provide a 'wrong signal' to policymakers. For instance, to increase the total stock of human capital (as measured in 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 the births of boys over girls, simply because the (market) lifetime income of women is lower than that 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 though 'bad' policies such as demolishing a brand new building and constructing exactly the same one 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

235. 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 small number 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 are valuable as they can be used 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 (microdata): 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 capture non-monetary benefits from education better 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).

236. 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, where 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 the sustainability of development across countries and inequalities within countries. While the measurement of human capital in the past has been mostly a topic of research, 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) means the full potential of human capital data cannot be used to analyse whether a country is on a sustainable path. A more comprehensive approach, which takes into account all aspects of human capital from a sustainability viewpoint, is needed.

237. 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

238. Social capital relates to the quality of inter-personal relationships. Repeated and positive interaction between people builds up trust. In addition, this interaction, among other things, contributes to maintain norms and values which are vital to the proper functioning of societies.

239. The importance of repeated inter-personal relationships and 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 et al (1983) and Putnam (1995) point at the collective characteristics of network creation.

240. Originally, the sociologically inspired literature strongly emphasised network creation as the main aspect of social capital. Fukuyama (1995), on the other hand, placed 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 through which individuals can build up trust in 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 perceive 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.

241. 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. If the effects of network creation primarily impact on the individual level, he suggests that the term 'human capital' be used. 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.

242. 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 the current publication, 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

243. There are three channels through which social capital can 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

244. The 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 (2001) 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 (e.g. consumption of goods and services), the quality of social networks – and the well-being that individuals derive from them – is included.

245. 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.[31] 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

246. 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 capital), 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; Soete and Freeman, 1997) shows that co-operation between firms, as well as between firms and universities, stimulates the creation and diffusion of knowledge.
- *Human capital*: Teachman et al. (1997) stress the importance of social capital in the process of human capital formation. Coleman (1988) also emphasises the importance of parents in the education of their children. The better the contact between parents and children, 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 participate properly 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).

[31] Bonding capital is referred to as horizontal social capital, i.e. when people have strong bonds and socialise with other members of their family, community etc. Bridging capital is perceived as vertical social capital, when people interact with a wider network of individuals from different social backgrounds and status, but often with weaker bonds between them. Linking capital refers to connections between those with different levels of power or social status (e.g. links between individuals from different social groups). For more literature on these types of social capital, see Putnam 2000, Woolcock 2001, and Aldridge et al. 2002.

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

The effect of social capital on general socio-economic efficiency

247. 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 should also pay due attention to the trust that is being built up in these networks. Halpern (1999) argues that transaction costs may decrease as the levels of social capital increase. Generalised trust and the creation of commonly shared norms and values may result in informal sanctions on breaches of promises.

248. These informal checks on the behaviour of actors have proven 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 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.

249. The political economics literature has also emphasised the importance of good relations between state and society (Alesina and 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.

250. 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 citizens' participation in such activities can play an important role in the building-up of social capital.

5.6.3. Physical indicators and valuation

251. 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 way to monetise social capital is to use time use surveys to measure the time that people spend on building up networks with others and apply 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 the strong assumptions necessary to make such calculations.

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 and cover for example visits to cultural institutions, use of written or audiovisual media, and own cultural activities undertaken as an amateur[32].

Participation in these activities contributes in many ways to building up, consolidating and developing social capital. Visiting cultural institutions leads to physical encounters with, and immersion in, 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 events such as plays, concerts, films and visiting cultural heritage, brings people into contact with the shared norms and values of society. This is crucial for building social identity and cohesion. Participation in cultural activities 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 consolidating the ties between the citizens and the state or its institutions. Moreover, media in their various and expanding forms establish local but also worldwide social networks and audiences (TV, radio and, most notably, the internet), and contribute to form social capital.

Lastly, cultural activities by amateurs, such as singing in a choir, playing an instrument in an ensemble or taking dancing 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 play an important part in social capital and contribute 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.

5.6.4. Selection of themes

252. The definition of social capital used in the framework 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. The framework 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

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

5.7. The limits of monetisation

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

254. 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. Most monetisation techniques 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. [33]

- *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 the publication).

- *Discount rates*. To value capital, future income flows must be discounted and then summed up. Debate on 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 result in large differences in the monetary value of the capital stock. Some of these problems can be overcome by means of sensitivity analysis. In some cases, such as the SEEA Central Framework, recommendations are given to limit the value interval.

- *Technical progress*. To estimate future income flows, 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 the future. These predictions are difficult to make and sometimes arbitrary.

255. While some of these assumptions are implicitly used for the monetisation of market capital (National Accounts capital measures are critically shaped by them), statistical offices may be reluctant to apply them as such measures may be too far removed from the realm of official statistics.

The World Bank approach

256. 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. If these stocks are calculated using a common measure 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.

[33] 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 correct 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).

257. Unfortunately, there is no dataset for a large group of countries where all the different types of assets are measured through a common measure (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 a small number of countries, with additional information on economic and natural capital, for the period from 1995 to the present.

258. 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 (if negative) or adding to them (if positive).

259. The term 'genuine' was coined by Hamilton to stress that the relevant flows include investments not just in 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)".

260. 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 to an amount equivalent to the depletion of its non-renewable resources.

261. In the World Bank approach, total wealth is measured as the discounted sum of consumption expenditure 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 the current publication is much wider than consumption. Therefore, the monetary estimates of *total* wealth developed by the World Bank exclude *all* non-economic benefits of the different types of capital and are therefore not entirely suitable for measuring sustainable development in the sense described in the current publication.

262. 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.

263. 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, for example 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.

264. While ingenious, the measurement technique used by the World Bank implies that estimates of intangible capital include (i) assets not (properly) taken into account in the measurement of economic and natural capital (e.g. 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) 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). In addition, Dietz and Neumayer (1999) in particular have put forward quite fundamental criticism.

265. First of all, these authors stress that the World Bank approach is based on a model of an inter-temporal efficient economy developing along an optimal path. This model is in turn based on a number of very strong assumptions, such as the existence of a complete set of property rights (and hence the absence of externalities), perfect functioning of markets, complete information, rational agents, and it uses a social discount rate (World Bank 2006, p. 144). In the real world, however, natural resources are affected by important market failures and negative externalities (e.g. due to a lack of property rights). In the presence of these factors, an economy may follow a non-sustainable path of development. Following Pearce and Turner (1989), Dietz and Neumayer (1999) maintain that, as a result of market failures for natural assets, positive genuine savings can be associated with non-optimal resource prices to such an extent that these assets are being used in a non-sustainable way.

266. A second problem is related to the fact that the model is vulnerable to external technology shocks and terms of trade shocks, as well as to changes in discount rates. These shocks will imply that the market prices that existed at the outset will no longer be optimal after a shock, i.e. they will no longer adequately reflect economic scarcities (Neumayer, 1999). Under these circumstances, trends in genuine savings will not give reliable information on whether societies are on a sustainable growth path or not (Dietz and Neumayer, 1999). The only way to avoid the effects of exogenous shocks would be by re-estimating prices, an idea which Hamilton (1995) has rejected as being impractical.

267. Another problematic issue concerns how the total wealth estimates should be interpreted. Hamilton and Ruta (2006) argued that while stable or growing total wealth per capita is no guarantee for sustainable development, the opposite is a guarantee of its impossibility. That is, in the face of a declining stock of total wealth per capita, well-being will in the long run deteriorate and sustainable development will not be possible (CES, 2009, p. 5). However, this conclusion depends on the assumption of 'weak sustainability', i.e. on the view that the decline in the stock of one type of asset, measured at currently prevailing prices, could be compensated by the rise of another one.

268. As underscored by both the WGSSD and the Stiglitz-Sen-Fitoussi reports, in the presence of 'critical' types of capital (i.e. capital types not deemed to be substitutable, at the margin, with other assets), meeting this 'weak sustainability' criterion will not guarantee sustainability. For example, the effects on people's well-being of higher concentrations of greenhouse gases in the atmosphere (which could lead to irreversible climate change) or of losses in biodiversity may not be adequately compensated by increases in economic, human or social capital valued at today's prices. Therefore, the WGSSD Report argued for the need to supplement monetary estimates of total wealth with physical measures of the various types of critical capital.

269. Overall, it can be concluded that the World Bank estimates are very important. A lot of data have been gathered, and this project has boosted research into capital measurement. However, much remains to be done to make these residual estimates more reliable (Ferreira, Hamilton and Vincent, 2008). There are still doubts as to whether the genuine or adjusted saving rates provide reliable information on whether countries are on a sustainable growth path. Ferreira, Hamilton and Vincent (page 750) argue that trends in consumption in OECD countries cannot be explained by capital accumulation alone, even if a broad definition of capital is used. This finding points to the importance of technology, or Multi Factor Productivity (MFP), as an explanatory factor, which follows earlier observations by Weitzman and Löfgren (1997) that the omission of technical progress from empirical net investment causes measures of net national product to understate future consumption. More research efforts are hence needed to improve some of the capital estimates and/or to introduce technology in the model.

270. Returning to the issue of monetisation in more general terms, the current publication raises caution when it comes to monetisation because of the underlying assumptions listed above. It is important to state that some monetary aggregates that use such assumptions are already included in official statistical standards: economic capital (SNA 2008) and natural capital (SEEA 2012 Central Framework). Monetisation has therefore moved from the traditional economic realm to natural resources. As the boundaries of what are considered official statistics are constantly evolving, the work of the World Bank and other institutes is valuable and points to fruitful directions for research.

CHAPTER 6. MEASURING TRANSBOUNDARY IMPACTS

6.1. Concepts and definitions

271. 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'. The current framework takes a broader view of how the development paths of different countries impact on each other in the context of sustainable development.

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

273. Especially since the publication of the Brundtland Report, the literature on 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, their measurement is less advanced and therefore they are not covered in detail here. The concluding section discusses opportunities to expand the range of indicators in this field.

274. The Brundtland Report argued that, to achieve global sustainable development, poverty on our planet needs to be reduced, and that it is a collective responsibility of all countries. This goal is still relevant today. Many organisations have justified the inclusion of indicators for 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 poverty reduction in developing countries. The type of poverty discussed by the Brundtland Report is the 'extreme' or absolute poverty conventionally defined by the number of people living on less than 1 to 2 dollars per day, and is mainly concentrated in developing countries.

275. Another way how countries may impact each other is through trade. Exporting goods and services might help developing countries to boost economic prosperity and reduce extreme poverty. However, foreign trade does not necessarily have beneficial effects for the well-being of people living in developing countries, and particularly for the poorest people. For example, imports of natural resources from countries with weak 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'.

276. 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 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 CO_2-intensive products (Peters, 2008, Weber et al., 2008; Peters and Hertwich, 2006/2008; Babiker, 2005). The 'pollution haven' and 'race to the bottom' hypotheses 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 to suggest that 'rich' countries are exporting their environmental burden to other countries.

277. Moreover, 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 pressure that is generated in the life cycle of a consumption product.

278. 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. But the approach has 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): ecological footprint measures include estimates of the hypothetical area of forest 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 larger ecological footprint.

279. 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 concerned. The footprint of a country in terms of its (GHG) emissions can then be represented by the following equation:

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

280. In other terms, the footprint measure includes both emissions from domestic production and those 'embodied' in products that are imported. The emissions embodied in exports are subtracted, because these will serve as input for consumption in other countries[34]. The environmental trade balance is usually calculated by the following equation:

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

281. 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 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 harmonised (see e.g., the following two bullets). Recently, an EU-funded project (OPEN-EU) compared and made suggestions for the harmonisation 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, fertiliser 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

[34] A footprint indicator uses the 'consumption perspective'. It is based on the ethical viewpoint that the final consumer is responsible for all emissions in the life cycle of a product. The 'production perspective' takes the viewpoint that a country is responsible for emissions from total 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).

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 assess the whole life cycle (see following 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										

282. Footprint indicators based on input-output tables are increasingly being adopted by statistical institutes and government agencies[35]. Their use is expected to rise in the future, as more MRIO data become available (see Table 6.2 for a summary of information in a number of important databases).

[35] Examples include Statistics Canada, 2012; Rørmose et al, 2009; Eurostat, 2012; Lenglart, 2010; Destatis, 2010; Edens et al, 2011;; Statistics Sweden 2003; Nijdam et al., 2005; Wilting and Vringer, 2009; Wilting, 2012; Defra, 2012; Wiedmann et al., 2008. For an overview of the work at national statistical organisations and government institutes, see Hoekstra et al., 2013.

Table 6.2. Multiregional Input-output (MRIO databases)

	GTAP	EXIOPOL/ CREEA	WIOD	EORA	OECD
Full name of 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 funded project lead by Fondazione Eni Enrico Mattei (FEEM) CREEA: EU FP7 project lead by TNO, Netherlands	EU funded project led 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)	40 (27 EU, 12 non-EU and a RoW) (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)	Timmer et al. (2012)	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

283. The transboundary impacts of sustainable development are much broader than the impact of each country on the natural capital in other countries. However, indicators suitable for measuring other aspects of the international dimension are still rare. A number of areas 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 workers from countries with lower income levels, which 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. Knowledge transfers may take place 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 of international institutional capital.[36]

6.2. Selection of themes

284. Table 6.3 shows the themes for the transboundary impacts used in the remainder of the publication. TI1 will contain indicators that show how developed countries may affect 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 related to the issues raised above are brain drain (TI7); knowledge transfers (TI8 and TI9); international financial flows (TI10) and international institutions (TI11).

285. Table 6.3 shows that the indicators can be broken down by countries/regions. The relevant region may vary significantly per indicator. For example, by definition, ODA 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 to identify the relevant spatial scale for the indicators of transboundary impacts.[37]

[36] E.g., the Swiss SDI set includes themes and indicators on transboundary impacts (called Globo in the Swiss set): http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/02/02.html

[37] In some cases data and indicator methodology should be considered on a case-to-case basis to ensure appropriate interpretation and usefulness to policymakers. For example 'energy resources', 'water', 'climate' all appear under the 'natural capital sub-dimension' , but transboundary impacts may be quite different, e.g. due to temporal and spatial differences in the carbon and hydrologic cycles.

Table 6.3. Selected themes of 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 capital	TI8. Physical capital				
		TI9. Knowledge capital				
		TI10. Financial capital				
	Social capital	TI11. Institutions				

PART III. SUSTAINABLE DEVELOPMENT INDICATORS

286. Part III. of the publication 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 organisations to measure sustainable development. The data required to compile these indicators are generally widely available.

287. This part of the publication is aimed at statistical offices and sustainable development agencies that want to build or revise their SDI sets. It can also be of use for policymakers who want to explore how to monitor the impact of policies or strategies targeting sustainable development objectives. Lastly, 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.

288. 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 the publication, i.e. 'here and now', 'later' and 'elsewhere', as well as the 'thematic categorisation' of 20 sustainable development themes.

289. Chapter 8 presents the indicator sets proposed by the 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 organisations. 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. FRAMEWORK FOR SUSTAINABLE DEVELOPMENT INDICATORS

7.1. The framework

290. The framework for measuring sustainable development presented here 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.[38] In addition, the framework includes the 20 themes presented in Part II. The conceptual and thematic categorisations are explained further in section 7.2.

291. Although the framework is generic, this does not imply that all themes are equally important for all countries. It should also be 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 countries.

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

7.2. Conceptual and thematic categorisations

293. 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 identified in the publication (referred to as thematic categorisation). Both categorisations, and the advantages and disadvantages associated with them, are discussed below.

Conceptual categorisation

294. 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' as discussed in Parts I and II of the publication.

295. To make it easier to refer to the themes throughout the publication, 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.

[38] These dimensions should not be confused 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 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: Lightly shaded areas denote non-monetary capital indicators (physical indicators) and dark shaded areas denote monetary capital indicators.

296. 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 viewpoint, 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 to exclude 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 (lightly shaded areas).
    - The *monetary capital approach* where all capital stocks are monetised (dark shaded areas).

297. The last two columns of Table 7.1 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 an SDI set. Therefore, where 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

298. The thematic categorisation organises the indicators according to the 20 themes defined in Part II of the publication. 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.[39]

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		
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		

[39] Users may wish to combine related themes according to country specific needs. For example, the themes *energy* and *climate* are interconnected and could be combined in one theme *climate and energy*.

Linking the conceptual and thematic categorisations

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

300. One of the main tasks included in the Task Force's Terms of Reference was to link these two approaches. The framework proposed in Table 7.3. can be used to analyse the existing SDI sets or as a basis for developing new ones. The existing SDIs can be compared to the framework to see whether important themes are missing from them. 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 the publication (human well-being, capital, transboundary impacts).

301. In Table 7.3, the themes proposed in the Chapters 4-6 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.

Table 7.3 Linking the conceptual and thematic categorisations

Themes	**Dimensions**		
	Human well-being	**Capital**	**Transboundary impacts**
	('Here and now')	**('Later')**	**('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		EC3	TI4
Economic capital - monetary		*EC-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.

Advantages of the conceptual categorisation

302. *Trade-offs between 'here and now', 'elsewhere' and 'later'.* The main advantage of the conceptual categorisation is that it allows 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') to be identified. It is much more difficult to track down these trade-offs in the thematic categorisation.

303. *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 discussed in Chapter 3. As a consequence, the conceptual approach is more amenable to economic modelling.

304. *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* (SNA) and the *System of Environmental-Economic Accounting* (SEEA).

Advantages of the thematic categorisation

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

306. *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 the current publication. For example, complementary to the capital stock indicators, sub-indicators on investments or efficiency (productivity) could be added, as they provide information on trends in some drivers of sustainable development. These may in turn be relevant to policymakers seeking to influence those drivers in order to promote sustainability.

Use of one or both categorisations

307. 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

308. The conceptual model presented in Part I was summarised in 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 distinction between the various types of available indicators. 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.

309. The following typology is used in the publication 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 categorisation. With regard to the different dimensions of sustainable development, the core indicators are used for the assessment of:

- *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).*
- *Additional (ADD).* This is an additional core indicator which measures an aspect of the phenomenon which is not covered by the main core indicator.

(b) *Policy drivers.* These indicators provide information on how the core indicators are influenced.[40] 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 productivity, and shows how much capital input is required per unit of output.
- *Other (OTH).* While it is possible to expand the typology further, the Task Force considered the above categories sufficient for the purposes of the framework and all the remaining types of indicators are grouped together under 'other' indicators.

[40] There are cases in which the headline indicator is quite a rough proxy, which makes it difficult to find a proper policy driver. A good example is the theme 'Land and ecosystems', which is measured with the Bird Index. It is quite clear that this bird index only describes a small aspect of the sustainable development issues concerning 'land and ecosystems'. Due to a lack of data, this index was chosen. However, this does hamper the development of proper indicators concerning policy drivers.

CHAPTER 8. SUSTAINABLE DEVELOPMENT INDICATORS: THREE PROPOSED SETS

8.1. Introduction

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).

310. 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. Lastly, 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

311. Chapter 7 explained how SDI sets can be organised in two ways: according to either the conceptual or the thematic categorisation. The chapter identified the relevant sustainable development themes for each categorisation. In this section, the selection procedure used by the Task Force to select the actual indicators for these three sets is explained in more detail.

312. Three criteria are used in the selection process:

a) *Ideal indicators*. The conceptual approach used in the publication is the most important criterion used by the Task Force in selecting indicators: this approach dictates which indicators are 'ideal', thus would best fit what we want to measure (see Annex IV for a discussion of ideal indicators for each of the 20 themes. This Annex identifies what the indicators should measure from a conceptual point of view, but also discusses the types of indicators that may be used if these ideal indicators are not available.).

b) *Commonalities.* A second criterion was to look at the prevalence of the various indicators in existing SDI sets. 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 countries members of the TFSD. 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 (see Annex VII).

313. Figure 8.1 shows the selection procedure for the two large sets. The indicators are chosen based on the first two selection criteria, 'ideal' indicator and commonalities, but with a distinct hierarchy between them. The 'ideal indicator' is the most important criterion, while the prevalence of indicators in existing SDI sets ('commonalities') is a secondary consideration. This implies that if an indicator is common to many SDI sets, but is not considered 'ideal' to measure any of the dimensions of the conceptual framework, it is not included in the set proposed by the Task Force. For example, indicators pertaining to transport (or 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 the publication. Alternatively, if an indicator is part of the ideal indicator set, but is rarely used in the current SDI sets (e.g. hours worked), it is still included in the large sets proposed here. Data availability is not a criterion in the selection of indicators in the two large sets. As a result, if an indicator is not available in international databases, a 'place holder' is included.

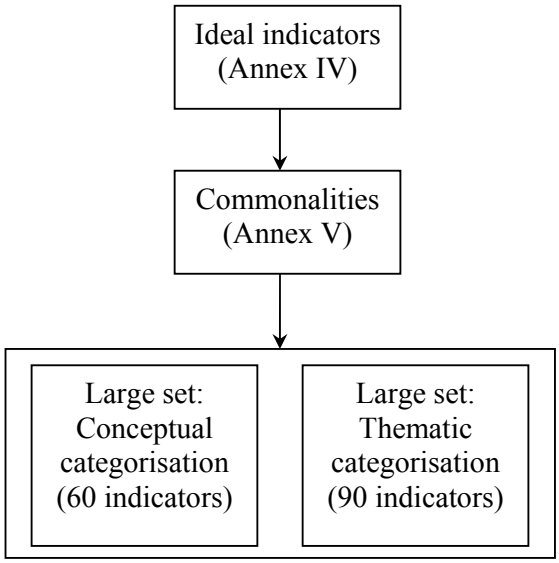

Figure 8.1 Selection procedure for the large sets

314. For the small set, the hierarchy in the selection criteria is reversed. Data availability is the most important criterion. Only the indicators in the large thematic set which are available in international databases are even considered for the small set. If a certain theme has several indicators that are available in international databases, the secondary criterion ('commonalities') is used. Lastly, in some cases the 'ideal indicators' play a role in the selection procedure. 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 V 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.
(c) Two indicators showing distribution/inequality. The two most common indicators for distribution (income inequality and gender pay gap) are selected.

315. The small set is based primarily on data availability. This is an important aspect given the budget cuts which statistical offices are currently facing. Besides, as sustainable development is largely a global problem, there is a great need for indicator sets that are comparable at a global level.[41]

8.3. Two large sets of indicators

316. Tables 8.1 and 8.2 present the two large sets of indicators, according to the conceptual and the thematic categorisation respectively. Both tables contain a column to represent the national totals/averages, and a column for indicators showing the distribution of the variable concerned among the population. Each indicator has an identification number that is used in different tables and annexes to facilitate finding information about the specific indicator throughout the publication.

[41] This approach also has its drawbacks. For example, the publication does not give guidelines for individual countries with specific sustainable development strategies. It aims rather at ensuring a policy relevance across countries by investigating to what extent the indicators presented in this publication can be used in the Post Rio+20 context (see section 9.3).

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	1. Life satisfaction	
		HWB2. Consumption and income	2. Final consumption expenditure	7. Income inequality, 8. Gender pay gap
		HWB3. Nutrition	9. Obesity prevalence	
		HWB4. Health	10. Life expectancy at birth	15. Distribution-health
		HWB5. Labour	16. Employment rate	19. Female employment rate, 20. Youth employment rate
		HWB6. Education	22. Educational attainment	27. Distribution-education
		HWB7. Housing	30. Living without housing deprivation	
		HWB8. Leisure	32. Leisure time	
		HWB9. Physical safety	33. Death by assault/homicide rate	
		HWB10. Land and ecosystems	39. Bird index	
		HWB11. Water	44. Water quality index	
		HWB12. Air quality	47. Urban exposure to particulate matter	
		HWB13. Trust	71. Generalised trust	
			72. Bridging social capital	
		HWB14. Institutions	75. Voter turnout	77. Percentage of women in parliament
Capital ('Later')	Economic capital	EC1. Physical capital	79. Physical capital stock	
		EC2. Knowledge capital	80. R&D capital stock	
		EC3. Financial capital	86. Assets minus liabilities	
		EC-M. Economic capital	*91. Economic capital*	
	Natural capital	NC1. Energy resources	59. Energy resources	
		NC2. Non-energy resources	65. Non-energy resources	
		NC3. Land and ecosystems	35. Land assets	
			39. Bird index	
		NC4. Water	44. Water quality index	
		NC5. Air quality	47. Urban exposure to particulate matter	
		NC6. Climate	52. Global CO_2 concentration	
			57. State of the ozone layer	
		NC-M. Natural capital	*92. Natural capital*	
	Human capital	HC1. Labour	16. Employment rate	19. Female employment rate, 20. Youth employment rate
		HC2. Education	22. Educational attainment	27. Distribution-education
		HC3. Health	10. Life expectancy at birth	15. Distribution-health
		HC-M Human capital	*93. Human capital*	
	Social capital	SC1. Trust	71. Generalised trust	
			72. Bridging social capital	
		SC2. Institutions	75. Voter turnout	77. Percentage of women in parliament
		SC-M. Social capital	*94. Social capital*	
Transboundary impacts ('Elsewhere')	Consumption and income	TI1. Consumption and income	5. Official Development Assistance (ODA)	
			6. Imports from developing countries	
	Economic capital	TI2. Physical capital	81. Exports of physical capital	
		TI3. Knowledge capital	82. Exports of knowledge capital	
		TI4. Financial capital	90. Foreign direct investment (FDI)	
	Natural capital	TI5. Energy resources	63. Imports of energy resources	
		TI6. Non-energy resources	70. Imports of non-energy resources	
		TI7. Land and ecosystems	41. Land footprint (foreign part)	
		TI8. Water	46. Water footprint (foreign part)	
		TI9. Climate	56. Carbon footprint (foreign part)	
	Human capital	TI10. Labour	21. Migration of human capital	
	Social capital	TI11. Institutions	78. Contribution to international institutions	
Context		Population	95. Population size	

317. Table 8.1 contains 60 indicators overall, of which 12 pertain to distributions. Note that some indicators are included twice in Table 8.1, 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 these themes 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 of 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.

318. 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 countries, regardless of whether they are more in line with a conceptual or a thematic approach.

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	1. Life satisfaction		
TH2. Consumption and income	CORE-HW	2. Final consumption expenditure	DIST	7. Income inequality
	OTHER	3. GDP per capita	DIST	8. Gender pay gap
	OTHER	4. Labour productivity		
	CORE-TI	5. Official Development Assistance (ODA)		
	CORE-TI	6. Imports from developing countries		
TH3. Nutrition	CORE-HW	9. Obesity prevalence		
TH4. Health	CORE-HW/C	10. Life expectancy at birth	DIST	15. Distribution-health
	CORE-ADD	11. Healthy life expectancy at birth		
	CORE-ADD	12. Suicide death rate		
	INV	13. Health expenditures		
	DEPR	14. Smoking prevalence		
TH5. Labour	CORE-HW/C	16. Employment rate	DIST	19. Female employment rate
	CORE-ADD	17. Hours worked	DIST	20. Youth employment rate
	DEPR	18. Average exit age from labour market		
	CORE-TI	21. Migration of human capital		
TH6. Education	CORE-HW/C	22. Educational attainment	DIST	27. Distribution-education
	INV	23. Expenditures on education		
	CORE-ADD	24. Competencies		
	DEPR	25. Early school leavers		
	INV	26. Lifelong learning		
TH7. Housing	CORE-HW	28. Housing stock		
	INV	29. Investment in housing		
	CORE-ADD	30. Living without housing deprivation		
	OTHER	31. Housing affordability		
TH8. Leisure	CORE-HW	32. Leisure time		
TH9. Physical safety	CORE-HW	33. Death by assault/homicide rate		
	INV	34. Expenditures on safety		
TH10. Land and ecosystems	CORE-C	35. Land assets		
	INV	36. Protected areas		
	DEPR	37. Nutrient balance		
	DEPR	38. Emissions to soil		
	CORE-HW/C	39. Bird index		
	DEPR	40. Threatened species		
	CORE-TI	41. Land footprint (foreign part)		

TH11. Water	CORE-C	42. Water resources		
	DEPR	43. Water abstractions		
	CORE-C	44. Water quality index		
	DEPR	45. Emissions to water		
	CORE-TI	46. Water footprint (foreign part)		
TH12. Air quality	CORE-HW/C	47. Urban exposure to particulate matter		
	DEPR	48. Emissions of particulate matter		
	CORE-ADD	49. Urban exposure to ozone		
	DEPR	50. Emissions of ozone precursors		
	DEPR	51. Emissions of acidifying substances		
TH13. Climate	CORE-C	52. Global CO_2 concentration		
	DEPR	53. Historical CO_2 emissions		
	DEPR	54. GHG-emissions		
	INT	55. GHG-emission intensity		
	CORE-TI	56. Carbon footprint (foreign part)		
	CORE-C	57. State of the ozone layer		
	DEPR	58. CFC emissions		
TH14. Energy resources	CORE-C	59. Energy resources		
	DEPR	60. Energy consumption		
	INT	61. Energy intensity		
	OTHER	62. Renewable energy		
	CORE-TI	63. Imports of energy resources		
	OTHER	64. Energy dependency		
TH15. Non-energy resources	CORE-C	65. Non-energy resources		
	DEPR	66. Domestic material consumption		
	PROD	67. Resource productivity		
	DEPR	68. Generation of waste		
	INV	69. Recycling rate		
	CORE-TI	70. Imports of non-energy resources		
TH16. Trust	CORE-HW/C	71. Generalised trust		
	CORE-HW/C	72. Bridging social capital		
	INV	73. Contact with family and friends		
	INV	74. Participation in voluntary work		
TH17. Institutions	CORE-HW/C	75. Voter turnout	DIST	77. Percentage of women in parliament
	CORE-ADD	76. Trust in institutions		
	CORE-TI	78. Contribution to international institutions		
TH18. Physical capital	CORE-C	79. Physical capital stock		
	INV	80. Gross capital formation		
	CORE-TI	81. Exports of physical capital		
TH19. Knowledge capital	CORE-C	82. R&D capital stock		
	INV	83. R&D expenditures		
	CORE-ADD	84. Knowledge spillovers		
	CORE-TI	85. Exports of knowledge capital		
TH20. Financial capital	CORE-C	86. Assets minus liabilities		
	OTHER	87. Consolidated government debt		
	OTHER	88. Current deficit/surplus of government		
	CORE-ADD	89. Pension entitlements		
	CORE-TI	90. Foreign direct investment (FDI)		
Context		95. Population size		

8.4. A small set of indicators

319. 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.

320. Members of the Conference of European Statisticians 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[42]. However, the analysis of various SDI sets undertaken by the Task Force shows that most usually include more headline indicators (between 15-20).

321. Table 8.3 shows the small set of indicators. The set is a subset of the large set of 90 indicators, based on 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 V). Box 8.1 summarises a number of alternative strategies to create a small set.

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

Theme	Indicator
TH1. Subjective well-being	1. Life satisfaction
TH2. Consumption and income	2. Final consumption expenditure
	5. Official Development Assistance (ODA)
	6. Imports from developing countries
	7. Income inequality
	8. Gender pay gap
TH3. Nutrition	9. Obesity prevalence
TH4. Health	10. Life expectancy at birth
TH5. Labour	16. Employment rate
TH6. Education	22. Educational attainment
TH7. Housing	30. Living without housing deprivation
TH8. Leisure	32. Leisure time
TH9. Physical safety	33. Death by assault/homicide rate
TH10. Land and ecosystems	39. Bird index
TH11. Water	43. Water abstractions
TH12. Air quality	47. Urban exposure to particulate matter
TH13. Climate	54. GHG-emissions
TH14. Energy resources	60. Energy consumption
TH15. Non-energy resources	66. Domestic material consumption
TH16. Trust	71. Generalised trust
TH17. Institutions	75. Voter turnout
TH18. Physical capital	80. Gross capital formation
TH19. Knowledge capital	83. R&D expenditures
TH20. Financial capital	87. Consolidated government debt
Context	95. Population size

[42] In the consultation of the draft report with members of the Conference of European Statisticians in March/April 2011

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 debatable, and have their limitations.

Correlation analysis. Some indicators may correlate strongly with others in the same set, rendering 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 developed by various institutions to facilitate the communication of their SDI sets and presents a number of specific examples.

Stakeholder consultations. Feedback from stakeholders can be used to reduce the number of indicators. Such consultations are most relevant at the national level and also help to obtain support for the indicator set. A good example is the process followed in Switzerland (FSOS, 2009).

Other criteria. Other criteria may be adopted to select indicators. For example, the OECD publication *How's life?* uses two criteria: relevance with regard to the target concept and quality of supporting data. [43]

8.5. Data availability and the relationship with official statistics

322. The mandate of the Task Force included an analysis of the proposed set of indicators from the point of view of data availability within official statistics. Annex VII provides the results of the analysis for 46 countries.

323. The availability of data needed to compile the selected indicators for 46 countries (EU and OECD member countries and Brazil, Russia, India, Indonesia, China, and South Africa) was assessed by looking at the databases of the United Nations, Eurostat, OECD and a few other organizations. The presence of data for the period 2000-2010 was 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. NSIs 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 NSIs, such a comprehensive analysis was deemed to fall outside the scope of the Task Force. Further details on data availability are provided in Annex VII.

324. Table 8.4 summarises to what extent the suggested indicators are available in the databases of the international organisations reviewed here. The indicators are divided into two categories: data currently available in the databases of the United Nations and Eurostat; and data available in OECD and other international databases[44]. In addition, a category of placeholders was

[43] 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.

[44] 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 US National Aeronautics and Space Administration (NASA) respectively). The OECD and World Bank databases were also checked. Note that the search of databases was not exhaustive. For example, the IMF also has data on a number of sustainable development indicators – GDP, consumption and income, employment, gross capital formation, imports, exports, FDI, and financial assets and liabilities.

distinguished, consisting of indicators needed on conceptual grounds but not yet available in international datasets.

325. Table 8.4 shows the data availability for the different indicator sets. Data are widely available for datasets based on the thematic categorisation in particular. For the small set by far most 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%).

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 (OECD, World Bank, European Social Survey, National Oceanic and Atmospheric Administration, NASA)	*9%*	*23%*	*0%*	*13%*	*7%*	*8%*
Placeholders:	*18%*	*35%*	*50%*	*32%*	*24%*	*0%*
Official statistics + place-holders from SEEA and SNA	*73%*	*58%*	*50%*	*62%*	*80%*	*92%*

326. The two large indicator sets also have a number of 'placeholders'. These indicators are not available in the databases analysed here and would need further development. However, what is not measurable or available today may become available in the future. The 'placeholders' included in Table 8.4 point to the need for the statistical community to develop better measurement methods for these themes in the future.

327. Several of the placeholders 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, SEEA2012 contains statistical guidelines for measuring data on energy resources and non-energy resources, which are not yet available in international databases, but are thus expected to become increasingly available in the future. The 'placeholders' for the stock of knowledge capital (based on the capitalisation of expenditures in Research and Development) and land assets are expected to become available following the implementation of SNA2008. The final row of the table shows the expected percentage of data availability if these placeholders are added to the data that are already available from official sources.

328. Other placeholders relate to footprint indicators (land, water, carbon footprint). and indicators pertaining to distributional issues and inequality (in health, housing, education).

Official statistics

329. The availability of sustainable development indicators in these international databases is important from the perspective of quality standards of official statistics, as all these international organisations (and most national data providers) assess the quality of the information that they disseminate.

330. Official statistics include any statistical activity carried out within a national statistical system[45], or under the statistical programme of an intergovernmental organisation[46]. They are by definition compiled in accordance with the Fundamental Principles for Official Statistics (see Annex VIII)[47], the European Statistics Code of Practice[48] or a similar authoritative international framework ensuring professional standards.

331. Data available from outside official statistical 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 differ from those applied in official statistics. Furthermore, the procedures of collecting, producing and disseminating data may also differ from those of official statistics. For example, there may be no obligation to protect data confidentiality, some stakeholders may have privileged access to the data, independence and impartiality may not be guaranteed.

332. The analysis based on the United Nations and Eurostat databases shows that 55-92% of the indicators are available from international statistical sources. After adding the placeholders derived from the two international statistical standards, SNA2008 and SEEA2012, the indicators that are expected to be available from official statistical sources in the near future amount to 62-92%.

333. The high availability of the suggested sustainable development indicators in data sources reviewed here suggests that official statistics are already advancing in measuring sustainable development.

[45] The national statistical system comprises the ensemble of statistical organisations and units within a country that collect, process and disseminate official statistics on behalf of national government. The system usually operates under a statistical law.
[46] Statistical Data and Metadata eXchange 2009: www.sdmx.org/
[47] http://unstats.un.org/unsd/methods/statorg/FP-English.htm
[48] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-32-11-955/EN/KS-32-11-955-EN.PDF

PART IV. THE WAY FORWARD

334. This final part of the publication outlines potential areas for future work. Section 9.1 focuses on measurement issues and points out some desiderata in terms of refining, extending and implementing the measurement system. In addition to building a measurement system, but due attention should be paid to a proper communication and visualisation of the data. Section 9.2 focuses on these issues. Lastly, section 9.3 investigates to what extent the indicators presented in the current publication fit in with global policy initiatives such as the Millennium Development Goals and the Sustainable Development Goals under construction.

Chapter 9. Future work: measurement, communication and the post Rio+20 agenda

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

9.1. Issues for further work

335. The Task Force has presented a conceptual framework which serves as a basis for three sets of potential indicators. The conceptual dashboards enable users 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 data availability, especially within the realm of official statistics.

336. In developing the framework and indicators to measure sustainable development, the Task Force has identified several areas where further work is needed:

(a) *Transboundary impacts.* More work is needed in the field of measuring the international aspects of sustainable development. In addition to the environmental aspects, the social and economic inter-relationships between countries should be part of any measurement system for sustainable development. The publication 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. Besides, the publication puts an emphasis on the transboundary impacts from the perspective of high-income countries. Future work should also take the perspective from the developing countries on board.

(b) *Further work on specific topics.* More work needs to be done to arrive at better capital indicators, which should not only be conceptually sound but also relevant for policy purposes:

- Human capital. More indicators for health in the context of human capital and sustainable development need to be developed.
- Social capital. Only 'trust' measures are widely used as indicators for social capital. Proper measures are still lacking for other important aspects of social capital such as 'norms and values' and 'bridging social capital' (i.e. charting how different groups in society are interconnected).
- Financial capital. Better indicators are needed in this field in order to address financial instability and macroeconomic imbalances and how they impact on sustainable development.
- 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 three areas:
    - Systematically linking ecosystem services to human well-being;
    - Focusing valuation on the basis of measurements of degradation;
    - Experimenting with Green National Accounting techniques.
- 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. In addition, different types of distribution should be distinguished. The present indicators are mainly gender based, but other breakdowns should also be included (income, educational attainment, rural/urban, age group, etc.). Given the fact that sustainable development is often interpreted in terms of *distributional justice* this topic should be high on any agenda of future work.

- Time use. More use can be made of information on time use in order to measure non-market activities which are relevant for sustainable development (especially in the field of human and social capital). This work can be based on the UNECE Task Force on Time Use Surveys Report on Guidelines for Harmonising Time Use Surveys.[49]

(c) *Linking subjective and objective indicators.* More work needs to be done to link subjective (perception) indicators of human well-being to actual living conditions (e.g. an objective measure of health linked to how people perceive their health). Ideally, this work could be undertaken using comprehensive surveys that gather information at a micro level for each of the different sustainable development themes distinguished in the publication, 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 that concerns inter-generational issues, long time series can be helpful to identify how present-day sustainability problems have come into existence.

(e) *Measuring sustainable development on different scales.* Attempts should be made to measure sustainable development on other scales than that of countries. For example, work could be undertaken to explore the possibility of applying the indicator set at company level, by harmonising the work of the Task Force with that of other initiatives such as the Global Reporting Initiative (GRI) in the business community. There are also ample opportunities to provide users 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 to study how economic, ecological and social developments are interrelated. Lastly, a distinction can be made between rural and urban areas (see e.g. the Millennium Development Goals, mentioned in section 9.3).

(f) *Satellite accounts*. Inspired by the adoption of the System of Environmental-Economic Accounting (SEEA) by the UN Statistical Commission, the possibilities to introduce satellite accounts for the other domains of sustainable development should also be explored (see also other important statistics such as energy accounts, balance sheets, input-output tables). This will improve the consistency between indicators and will ensure that *Beyond GDP* indicators are produced using the same concepts as GDP itself. Special attention should be paid to wealth, as measures of wealth are central to measuring sustainability (see recommendation 3 of the Stiglitz-Sen-Fitoussi Report). At the moment data availability is an issue as not all countries produce household balance sheets nor have the disposal of the corresponding micro data. On the micro side, a key piece of information to improve wealth measurement are the OECD Guidelines for Micro Statistics on Household Wealth.

337. Apart from possible refinements and extensions of the proposed dataset, the work of the Task Force may also serve as input for the on-going process of harmonising the measurement of human well-being and sustainable development:

(g) *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, so that they are better suited for international comparison. The publication contributes to the harmonisation of sustainable development measurement, by presenting a conceptual framework

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http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2013/TimeUseSurvey_Guidelines_for_consultation.pdf

that links the various existing measurement approaches. As a result, the similarities between the approaches become more visible than the differences. The conceptual foundation and the potential indicators suggested in the publication may serve as a good starting point for further harmonisation of the measurement systems and development of a set of indicators that could be used for comparison across countries.

9.2. Communication and visualisation

338. 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.

339. Communicating effectively about the wealth of data on human well-being and sustainable development is a true challenge. Annexes VIII (*Interpretation of SDI sets in the context of official statistics*) and IX (*Examples of visualisation tools used in the context of indicator sets*) discuss in more detail communication and visualisation techniques used by various institutes.

340. 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 (Annex IX discusses some of these dimensions in more detail).

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.

341. 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 go through an overwhelming number of separate indicators. The conceptual framework not only guides the statistician in the selection of indicators – and identification of missing indicators - but can also serve as a basis for effective visualisations (see Annex IX for some examples).

342. Many statistical offices try to help their users understand and interpret the information on sustainable development. At the core, there is a need to have a frame of reference against which the indicators can be measured.

343. Table 9.2**.** provides a summary of the frame of reference used by a selection of 27 countries. The table shows that most countries use stated policy targets as the frame of reference, while others, 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, often in EU and OECD countries.

344. A report may be narrative: describing statistics, identifying trends, but not making any judgements about interpretation, leaving this completely to the reader. But a report can be more analytical: making informed judgements or interpreting the statistics to assist the reader. It can also be a policy document, using statistics to support policy analysis or recommendations. In any case, it is important to discuss and decide from the outset what type of report is to be produced, and what its purpose is.

345. 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 VIII). Commonly referred to as 'equal access', the release process needs to manage this aspect of accessibility.

Table 9.2. Interpretation methods in selected countries

Country	Policy target	Desired trend	Country comparison
Australia		√	√
Austria	√		√
Belgium	√	√	
Bulgaria	√		√
Canada		√	
Estonia			√
European Commission	√	√	√
Finland	√		
France	√		√
Germany	√	√	
Hungary	√		√
Latvia	√		√
Lithuania	√		√
The former Yugoslav Republic of Macedonia			√
The Netherlands		√	√
New Zealand		√	
Norway	√		
Portugal	√		
Slovakia	√		√
Spain			√
Sweden		√	
Switzerland		√	√
United Kingdom		√	√

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

346. The difference between sustainable development indicators and other official statistics is often that the indicators may have already been published or released in their own right; however, they are analysed in a different context and the results may therefore 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.

347. 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 interpretation. Using a statistical framework rather than a policy-based framework can also help manage perceptions if the government of the day, and thus policy initiatives, change.

348. 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.

349. The effective use of technology is a key enabler in accessibility, but its use must be appropriate for the audience. A web-based report that needs to be accessed via a high-speed broadband could diminish the reach and usefulness of the statistics in some countries, while in other countries, this form of dissemination is the accepted norm. Sharing best practices is always a good starting point but remembering to adapt to national circumstances is also important for success.

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

351. 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.

352. The use of visualisation techniques can be a powerful way to engage users in sustainable development indicators and statistics in general. It also makes it possible to link information via web-pages and websites.

353. As many users now expect to have access to the data used in the compilation of the indicators, it is useful to think of these data as a statistical product in its own right and to consider the types of users and their needs. With a large set of indicators this can imply 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 expectations related to making available their information.

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

355. Table 9.3 identifies the key visualisation techniques in a range of countries. Graphs, charts and maps are among the more traditional techniques used, while more creative methods include colour schemes, symbols and techniques to predict the expected trend direction.

356. Web tools represent both the latest thinking on visualisation techniques but also a significant investment in research and resources. Annex IX presents some examples.

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

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

359. Lastly, communication about SDIs can be enhanced by increasing stake-holder participation in the dissemination of the results.

Table 9.3. Visualisation techniques in sustainable development reporting in selected countries

Country	Graphs/charts	Maps	Web tools	Colours	Symbols	Direction
Australia	√			√	√	
Austria	√	√				
Belgium	√				√ (Arrows)	
Brazil	√	√				
Canada	√	√	√			
Estonia	√		√			
European Commission	√				√ (Weather symbols)	
Finland	√			√	√ (Thumbs up/down)	
France	√			√	√ (Smilies)	√
Germany	√				√ (Weather symbols)	
Hungary	√					
Lithuania	√	√				
Luxemburg	√					
The Netherlands	√	√	√	√		√
New Zealand	√			√	√	√
Romania			√			
Sweden	√					√
Switzerland	√		√	√	√	√
United Kingdom	√			√	√	√

9.3. The post Rio+20 agenda

360. In order to enhance the usefulness of the indicator sets proposed by the Task Force, they should be linked to policy targets where possible. In particular, links between the work of the Task Force and the recommendations of the Rio+20 Conference on sustainable development should be explored.

361. The final document of the *Rio+20 United Nations Conference on Sustainable Development* outlines an agenda for further activities.[50] Two possible directions are relevant from the point of view of the Task Force. First, paragraph 38 of the outcome document *The future we want* 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 organisations, to launch a programme of work in this area building on existing initiatives".

362. Secondly, the outcomes of the Rio+20 Conference point to the need for policy action and formulating policy goals. Paragraph 104 of the outcome document of the Conference states that "we recognize 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 formulate Sustainable Development Goals (SDG) to replace or augment the Millennium Development Goals (MDG).

363. For the statistical world, paragraph 38 is of special relevance, especially because it stresses the importance of building on existing initiatives. The work of the Task Force can play an important role in the formulation of indicator sets in the post Rio context. However, the SDGs can

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

also be relevant for statisticians. Traditionally, measurement initiatives and work on policy, including the formulation of policy goals, are seen as rather different matters. The 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 each other. The measurement system and indicators proposed in Chapters 7 and 8 are conceptually sound and simultaneously provide policymakers with the indicators they are used to have.

364. Before exploring the possibilities to link the work of the Task Force to the initiatives mentioned above, the Task Force has checked to what extent data are available at a global level. The research on data availability and commonalities reported in Chapters 7 and 8 of the publication is biased towards the OECD and EU countries. However, to be able to link the work of the Task Force to the suggestions made within the Rio+20 context, additional work on data availability is necessary.

365. Table 9.4 provides information about global availability of data for the small set of indicators presented in Chapter 8.

366. The first two columns of this global set are identical to the small set of indicators presented in Chapter 8 (Table 8.3). Fourteen of the 24 indicators can be used for a world-wide small set of indicators. One indicator, imports from developing countries, was dropped as it is only relevant for high-income countries.

367. 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 most widely available indicator is the 'share of the poorest quintile in national consumption'.
- *Nutrition:* Obesity is mainly a problem in high-income countries. In a global dataset, malnutrition prevalence is more relevant.
- *Housing:* One of the few 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 greenhouse gas emissions are only available for a limited number of countries, CO_2 emissions (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 public sector management indicator developed by University of Calgary, Canada, Centre for Public Interest Accounting is used as proxy.

368. The overview of indicators shows that it is possible to build the small set of indicators presented in Chapter 8 on a global scale, even though the quality and international comparability of these data is not always as high as necessary. To see whether these indicators are relevant for the challenges facing the least developed countries in particular this small set is linked with the indicators on the achievement of the Millennium Development Goals.

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	1. Life satisfaction		135	World Happiness Database
Consumption and income	2. Final consumption expenditure		210	United Nations
	5. Official Development Assistance (ODA) paid	Official Development Assistance (ODA) received	143	World Bank
	6. Imports from developing countries	*Not relevant*	-	-
	7. Income inequality	Share of poorest quintile in national consumption	134	United Nations (MDG)
	8. Gender pay gap		68	United Nations
Nutrition	9. Obesity prevalence	Malnutrition prevalence	160	United Nations
Health	10. Life expectancy at birth		185	United Nations
Labour	16. Employment rate		145	United Nations
Education	22. Educational attainment		184	United Nations
Housing	30. Living without housing deprivation	Urban population in slums	91	United Nations (MDG)
Leisure	32. Leisure time		20	MTUS
Physical safety	33.Death by assault/homicide rate		186	United Nations
Land and ecosystems	39. Bird index	Bird species threatened	214	World Bank (WDI)
Water	43. Water abstractions		93	United Nations
Air quality	47. Urban exposure to particulate matter		173	United Nations
Climate	54. GHG-emissions	CO_2-emissions	229	World Bank
Energy resources	60. Energy consumption		187	United Nations
Non-energy resources	66. Domestic material consumption		200	SERI
Trust	71. Generalised trust	Public sector management	82	World Bank (WDI)
Institutions	75. Voter turnout		194	IDEA
Physical capital	80. Gross capital formation		156	United Nations
Knowledge capital	83. R&D expenditures		116	United Nations
Financial capital	87. Consolidated 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

369. The MDG indicators focus on highly relevant areas for human well-being and sustainable development of developing countries in particular (see Annex X 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. Many indicators specifically relevant for less developed countries were not included in the three indicator sets proposed in Chapter 8. However, if the large sets of indicators are also built on a global scale, these indicators can be added, for example as 'policy drivers'. Table 9.5 outlines how the MDG indicators can be linked with the global small set of indicators.

Table 9.5 Link between the proposed TFSD global set and the MDG indicators (MDG codes to be found in Annex X)

TFSD theme	TFSD global set (see Table 9.4)	MDG indicators
TH1. Subjective well-being	1. Life satisfaction	
TH2. Consumption and income	2. Final consumption expenditure	***1.4***
	5. Official Development Assistance (ODA) received	***8.1-8.5; 8.9***
	(7.) Share of poorest quintile in national consumption	***1.1; 1.2; 1.3; 1.6***
	8. Gender pay gap	***3.1- 3.3***
TH3. Nutrition	(9.) Malnutrition prevalence	***1.8; 1.9***
TH4. Health	10. Life expectancy at birth	***4.1- 4.3; 5.1-5.6; 6.1-6.10; 7.9***
TH5. Labour	16. Employment rate	***1.5; 1.7***
TH6. Education	22. Educational attainment	***2.1-2.3***
TH7. Housing	(30.) Urban population in slums	***7.10***
TH8. Leisure	32. Leisure time	
TH9. Physical safety	33. Death by assault/homicide rate	
TH10. Land and ecosystems	(39.) Bird species threatened	***7.1; 7.6; 7.7***
TH11. Water	43. Water abstractions	***7.4-7.6; 7.8***
TH12. Air quality	47. Urban exposure to particulate matter	
TH13. Climate	(54.) CO_2-emissions	***7.2; 7.3***
TH14. Energy resources	60. Energy consumption	
TH15. Non-energy resources	66. Domestic material consumption	
TH16. Trust	(71.) Public sector management (University of Calgary, Canada, Centre for Public Interest Accounting)	
TH17. Institutions	75. Voter turnout	
TH18. Physical capital	80. Gross capital formation	
TH19. Knowledge capital	83. R&D expenditures	
TH20. Financial capital	87. Consolidated government debt	***8.10***

370. Table 9.4 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 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 Chapters 7 and 8. In addition, Table 9.4 reveals how fruitful it is to link SDI sets to important (global) policy initiatives such as the Millennium Development Goals. There are great opportunities to link the work of the Task Force to policy initiatives which are part of the Post Rio+20 agenda.

371. The Sustainable Development Goals (SDGs), which at the moment of writing are under discussion, deal with themes which are very relevant from the viewpoint of human well-being and sustainable development.[51] However, significant work needs to be done to make these goals 'measurable'. It is important that statisticians play a role in the shaping of the definite SDGs: only if indicators are available to check how society is performing in the light of the sustainable development goals will society be informed whether it is on the right development path or not. After all, you can only manage what you can measure.

[51] Although no precise development goals are identified, in Part V of the outcome document 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 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.

GLOSSARY

capital approach - a method to measure sustainable development by calculating the stocks of capital. The capital approach is in line with the future-oriented view on sustainable development measuring the stock of economic, natural, human and social capital passed on to future generations (see section 2.3.3).

composite indicator - a composite indicator is formed when individual indicators are aggregated into a single index (OECD *Handbook on constructing composite indicators*). The Report distinguishes between 1) economic composite indicators – these are macroeconomic aggregate indices that are adjusted to provide a better indicator for (social) welfare or sustainable welfare (e.g. environmental damage is subtracted), and 2) non-economic composite indicators – these are composed of indicators from different statistical areas (often in different measurement units) by taking the averages or applying a more complex mathematical approach (see sections 2.1.2 and 2.1.3).

critical (natural) capital – this concept is reserved for certain capital stocks without which mankind would not be able to exist. The term is often used for types of natural capital, such as air, water and biodiversity. Conceptually the term critical capital could also be used for other capital stocks, but most scientific work has been done on natural capital (see section 5.4).

ecological well-being - a concept which focuses on the intrinsic value of the environment and ecosystems, and not just on the value these systems have for human beings.

economic composite indicators - see composite indicators.

economic capital - produced capital that includes fixed assets that are used repeatedly or continuously in production processes for more than one year. Fixed assets can be tangible – e.g. machinery, buildings, roads, harbours and airports – and intangible – e.g. computer software, original works of artistic value, and the ideas and innovations in R&D. The value of produced capital is recorded in the balance sheet of the National Accounts (see section 5.3).

financial capital - financial capital is defined formally to include any asset for which a counterpart liability exists on the part of another institutional unit. These include currency and other forms of bank deposits, stocks and bonds, derivatives, accounts receivable, pension funds and insurance reserves. Gold reserves are also considered financial assets, although they have no corresponding liability. The value of financial capital is recorded in the balance sheet of the National Accounts (see section 5.3).

future-oriented approach to sustainable development – in this approach, the goal of sustainable development is considered to be ensuring the well-being of future generations (see section 2.3.3).

human capital – there is no agreed, single definition of human capital. The most often used definitions are: "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" (OECD, 2001, p.18), and "the stock of economically productive human capabilities" (Bahrman and Taubman in World Bank, 2006, p.89).

human well-being - a broad concept which is not confined to the utility derived from the consumption of goods and services, but is also related to people's functionings and capabilities (i.e. freedom and possibilities they have to satisfy their needs). Well-being can be measured by objective and subjective indicators. Subjective well-being encompasses cognitive evaluations of one's life, happiness, satisfaction, positive emotions such as joy and pride, and negative emotions such as pain and worry. Objective measures cover the objective conditions and opportunities available to people to pursue their well-being.

integrated approach to sustainable development – in this approach, the goal of sustainable development is considered to be ensuring both the well-being of people living now, and the potential well-being of future generations.

monetisation – a technique whereby indicators are expressed in monetary terms. It can be applied to measures of capital, but can also be used to create economic composite indicators. The various methods of monetisation are discussed in the chapter on the measurement of capital (Chapter 5). The applicability and the underlying assumptions of monetisation are often a point of contention. The underlying debate and the limits to monetisation are described in sections 2.3.4 and 5.7.

natural capital - natural capital refers to the earth's natural resources, land and the ecological systems that provide goods and services necessary for the economy, society and all living things. This publication uses the capital boundary of the SEEA2012 Central Framework, but expands this to include ecosystems and climate.

non-economic composite indicators - see composite indicators.

social capital – social capital is interpreted in terms of social participation and networking, and the effects of these social interactions (i.e. building generalised trust and shared norms and values and culture). Social capital refers to people as well as institutions.

strong sustainability - assumes that substitution possibilities among capital stocks are limited, even in the face of technological progress, because of the essential nature of some capital stocks. It therefore demands that there be minimum levels below which stocks of critical capital should not be allowed to fall.

sustainable development – the publication follows the Brundtland definition, which states that sustainable development is "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Furthermore, the publication takes into account the well-being of people in other countries, which was also advocated in the Brundtland Report.

weak sustainability – assumes a perfect substitutability between the various stocks of capital. The depletion of one stock of capital - e.g. petroleum reserves - can be fully compensated by investment in another stock, e.g. human capital.

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ANNEX I. INTERNATIONAL INITIATIVES ON INDICATORS RELATED TO SUSTAINABLE DEVELOPMENT

372. This Annex provides a short overview of some of the international initiatives undertaken to harmonise the measurement of sustainable development and related concepts[52]. These are (in chronological order):

- 1992 – Commission for Sustainable Development (UN)
- 2001 – European Union Strategy for Sustainable Development (EC)
- 2005 – Working Group on Statistics for Sustainable Development (UNECE/OECD/Eurostat)
- 2007 – GDP and Beyond (EC)
- 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)
- 2011 – BRAINPOoL
- 2012 – E-frame (EC)
- 2012 – Rio+20 Conference (UN)

United Nations Commission on Sustainable Development

373. 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) held in June 1992, also known as the Earth Summit or Rio Conference.

374. 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

375. 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.[53]

376. 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 Task Force on Sustainable Development Indicators.[54]

[52] 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 harmonise measurement practices.

[53] For more information on the EU strategies and policies on sustainable development, see: http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/strategy_policy

[54] The Sustainable Development Indicators (SDIs) are used to monitor the EU Sustainable Development Strategies. They are presented in ten themes, see: http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators. This work is done within the framework of the European Statistical System (http://epp.eurostat.ec.europa.eu/portal/page/portal/pgp_ess/about_ess)

UNECE/OECD/Eurostat Working Group on Statistics for Sustainable Development (WGSSD)

377. The WGSSD is the predecessor of the Task Force on Measuring Sustainable Development (TFSD) that produced the current framework. The history of the WGSSD and the relationship with the TFSD is described in the beginning of the publication.

European Commission communication 'GDP and beyond'

378. 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 provide more comprehensive information to support policy decisions.

379. 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, 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

380. 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 organisations, urging "statistical offices, public and private organisations, 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 Measuring the Progress of Societies' was established.

381. In 2011, in the context of the OECD's 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 the publication). *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.

Stiglitz-Sen-Fitoussi Commission

382. In February 2008, 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

383. 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.[55] 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 2011, a series of actions were adopted by the European Statistical System to improve measurement tools in these fields.

BRAINPOoL (www.brainpoolproject.eu)

384. BRAINPOoL (acronym for Bringing Alternative Indicators into Policy) is funded by the European Commission under the FP7 programme, and is led by the Netherlands Organisation for Applied Scientific Research (TNO). The aim of the project is to help increase the influence of Beyond GDP indicators in policy, by improving knowledge transfer between those creating and promoting such indicators and their potential users.

385. The four key objectives of BRAINPOoL are: 1) Structuring the research reservoir on 'Beyond GDP' indicators by synthesising existing overviews of 'Beyond GDP' indicators, and assessing the degree to which they have been taken up in policy making; 2) Increasing the understanding of the user context of 'Beyond GDP' indicators; 3) Stimulating user-producer interactions; 4) Improving the relation between users.

E-frame (www.eframeproject.eu)

386. The E-frame consortium (acronym for European Framework for measuring progress), which is funded by the European Commission under the FP7 programme, is led by the Italian Statistical Institute (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 The final conference will be hosted by Statistics Netherlands at the beginning of 2014.

Rio+20 – United Nations Conference on Sustainable Development

387. In June 2012, the 'Rio+20' Conference was held 20 years after the initial United Nations Conference on Environment and Development (UNCED). One of the main outcomes of the Rio+20 Conference was the agreement by Member States to launch a process to develop a set of Sustainable Development Goals, which will build upon the Millennium Development Goals and converge with the post 2015 development agenda. Furthermore, paragraph 38 of the Rio+20 outcome document *The future we want* includes the main message targeted at the official statistical community: "We recognize the need for broader measures of 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". To address this request, the UN Statistical Commission set up a 'Friends of the Chair' group in February 2013.

[55] For more information on the work of the Sponsorship Group, see: http://epp.eurostat.ec.europa.eu/portal/page/portal/pgp_ess/about_ess/measuring_progress

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

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

Measure of Economic Welfare (MEW)

389. 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 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)

390. 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)

391. 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)

392. The Human Development Index (HDI) was created in 1990 by the United Nations Development Programme (UNDP, 1990). The HDI consists of three dimensions to capture different 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 Human Development reports published annually since 1990 (hdr.undp.org/en/reports/).

Genuine savings (GS)/National Wealth (NW)

393. 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 total sum of the monetary vales of the capital stocks that sustain well-being, while the GS describes the changes in stocks. The GS is the indicator of sustainability used by the World Bank (World Bank, 2006). The starting point for the calculation of GS is gross national savings, from which consumption of fixed capital is subtracted to obtain net national savings. 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)

394. 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[56]; 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)

395. 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).

[56] 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. CONCORDANCE TABLES BETWEEN SNA, SEEA AND THE THEMES USED IN THE FRAMEWORK

396. This Annex presents the relationships between the classifications used in the SNA and SEEA, and the sustainable development themes identified by the Task Force on Sustainable Development.

Table III.1. Concordance table between the SNA2008 and the sustainable development themes identified in the current framework

SNA2008		Theme in the TFSD framework
AN	Non-financial assets	
AN1	Produced non-financial assets	
AN11	Fixed assets	
AN111	Dwellings	EC1. Physical capital
AN112	Other buildings and structures	
AN113	Machinery and equipment	
AN114	Weapons systems	
AN115	Cultivated biological resources	
AN117	Intellectual Property Products	EC2. Knowledge capital
AN1171	Research and development	
AN1172	Mineral exploration and evaluation	
AN1173	Computer software and databases	
AN1174	Entertainment, literary or artistic originals	
AN1179	Other intellectual property products	
AN12	Inventories	
AN13	Valuables	
AN2	Non-produced non-financial assets	
AN21	Natural resources	See Natural Capital
AN22	Contracts, leases and licences	
AN23	Goodwill and marketing assets	
AF	Financial assets/liabilities	EC3. Financial capital
AF1	Monetary gold and SDRs	
AF2	Currency and deposits	
AF3	Debt securities	
AF4	Loans	
AF5	Equity and investment fund shares/units	
AF6	Insurance, pension and standardized guarantee schemes	
AF7	Financial derivatives and employee stock options	
AF8	Other accounts receivable/payable	

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

SEEA2012 classification	Theme in the TFSD framework
1 Mineral and energy resources	
1.1 Oil resources	NC1. Energy resources
1.2 Natural gas resources	
1.3 Coal and peat resources	
1.4 Non-metallic mineral resources (excluding coal and peat resources)	NC2. Non-energy resources
1.5 Metallic mineral resources	
2 Land	NC3. Land and ecosystems
3 Soil resources	
4 Timber resources	
4.1 Cultivated timber resources	
4.2 Natural timber resources	
5 Aquatic resources	
5.1 Cultivated aquatic resources	
5.2 Natural aquatic resources	
6 Other biological resources (excluding timber resources and aquatic resources)	
7 Water resources	NC4. Water
7.1 Surface water	
7.2 Groundwater	
7.3 Soil water	
	NC5. Air quality
	NC6. Climate

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).

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

397. This Annex explains which indicators would be 'ideal' to measure specific aspects of sustainable development from a conceptual point of view.

398. In many cases the object of measurement is an abstract concept which has to be estimated using 'second best' measures. For example, 'knowledge' is often estimated using more narrowly defined statistics for research & development or innovation. Similarly, measuring 'biodiversity' is a complex task and a large amount of proxies have been proposed. Although the Annex deals with 'ideal indicators', it also discusses the existence and shortcomings of 'second best' alternatives where relevant.

399. The Annex covers 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.

400. The Annex uses the indicator typology introduced in section 7.4 that makes a distinction between the 'core indicators' and 'policy drivers'. 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').

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

402. TH1. 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.

403. TH2. Consumption and income

Core indicators (national): This theme includes various macro-economic aggregates (such as GDP), as well as the drivers of economic growth. The Stiglitz-Sen-Fitoussi report (2009) emphasised the importance of using household income and consumption to measure economic progress. However, because the TFSD stresses the importance of intercountry comparisons, the indicator for final consumption expenditure is preferred.

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

Core indicators (transboundary impacts): Here the measures of redistribution of income between countries can be used (e.g. Official Development Assistance (ODA) and remittances). Imports from developing countries could be viewed as an indicator of wealth creation in those countries.

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

Indicators for distribution: How income is distributed among various population groups provides important information about inequality in a society. Distinction may be made according to gender, ethnicity, age, etc. Well-known examples are the Gini coefficient and the gender pay gap.

404. TH3. Nutrition

Core indicators (national): A healthy diet is an important driver of health and human well-being in general. However, problems related to nutrition will differ widely between countries. In some countries, obesity issues are important, while in others indicators for malnutrition should be used; and in some countries both indicators may be important.

405. TH4. 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 a 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. For example, a number of indicators exist in the literature which track the 'years of healthy life remaining'.

Policy driver indicators: The level of health expenditure is an obvious conceptual sub-indicator, but other indicators could be also used. The analysis of 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 healthy lifestyle) or problems of undernourishment are important driving forces for overall physical and mental health. Apart from the above policy driver indicators, there may also be indicators specific for the health situation in a country. Examples include the prevalence of physicians and hospital beds per person, or indicators related to major diseases such as HIV/AIDS and malaria.

Indicators for distribution: Given the role of health as a determinant of well-being it is important to measure how it is distributed in society (according to gender, ethnicity, age, socio-economic groups).

406. TH5. Labour

Core indicators (national): The participation rate, or unemployment, seem to be good indicators for this dimension, as joblessness has a large impact on human well-being. However, job quality although more difficult to measure, should also be taken into account as it is an important driver of human wellbeing.

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

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

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

407. TH6. Education

Core indicators (national): For the human well-being aspects of education, the average level of competencies and education are of interest. 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. Such indicators are regularly used, for example the PISA scores (for young age groups) as well as PIAAC scores (for whole population), collected through the OECD programmes.

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

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

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

408. TH7. Housing

Core indicators (national): An overall measure of the quantity and quality of the dwellings that people live in is needed. Of course, housing conditions are multifaceted and difficult to measure by a single figure. Indicators that measure certain aspects are living space (square metres per person) or the number of dwellings without deficiencies (leaking roofs etc.).

Policy driver indicators: Policy driver indicators include investment in dwellings, both in existing and new ones.

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 groups).

409. TH8. 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.

410. TH9. Physical safety

Core indicators (national): The overall level of crime would be a desired indicator. However, the severity of crimes may vary significantly and so it is conceptually problematic to arrive at one single indicator. Proxies that may be used include the number of crimes against persons or violent crimes.

Policy driver 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 are important to take into account when measuring physical safety.

411. TH10. Land and ecosystems

Core indicators (national): The area and value of land should be measured, as well as 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 it

Policy driver indicators: Indicators on extinct or threatened species, as well as land area for forests, nature reserves or built up areas may be used. Emissions to soil should be measured.

Core indicators (transboundary impacts): Countries implicitly 'use' land of other countries through the consumption of goods and services produced in these 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 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 indicator of transboundary impacts by taking into account the land use in other countries.

Other potential indicators: For some countries, the issue of land erosion may be relevant.

412. TH11. 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 driver indicators: Emissions to water, extraction and use of water would be appropriate policy driver indicators.

Other potential indicators: The overall amount of (fresh) water is only relevant in countries where it is a scare commodity. Specific information about access to water is important, since this is not a universal resource for all citizens in the world.

*Core indicators (*transboundary impacts*):* A water footprint could be calculated, similar to the land footprint.

413. TH12. Air quality

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

414. TH13. Climate

Core indicators (national): Since climate is a global stock it should be measured by the CO_2 concentration or the global temperatures. The state of the ozone layer would also be a good indicator of the climatic system. To assign a national responsibility to reductions in these capital stocks, accumulated emissions are needed (see for example Botzen et al., 2008). For example, it is possible to calculate the (cumulative) historical CO_2 emissions of countries using the Carbon Dioxide Information Analysis Center (CDIAC) database.
Policy driver indicators: 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 located in foreign countries) and the 'carbon balance of trade' can be measured (see 'footprint' in TH10 Land and ecosystems).

415. TH14. Energy resources

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

416. TH15. 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 driver indicators: Extraction and discoveries are important policy driver indicators. Material use, intensity and waste are also very relevant.
Core indicators (transboundary impacts): see energy resources.

417. TH16. Trust

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

418. TH17. Institutions

Core indicators (national): This indicator should reflect the quality of the institutions in society. Such a measurement is challenging, since the institutions are widely heterogeneous. There are, however, overall indicators in which the general public are asked to assess the

quality of institutions in their country. In this context, the work of De Soto on estimating the time it takes to overcome bureaucratic procedures is a useful example of potential measures.
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 measure the extent to which institutions are accessible to various groups in society (according to gender, ethnicity, age, socio-economic groups).

419. TH18. Physical capital
Core indicators (national): This capital stock should provide a summary value of the stock of machinery, equipment, buildings and infrastructure. These assets are part of the fixed capital in SNA 2008. Their estimation methods are summarised in the OECD handbook *Measuring Capita*l.
Policy driver indicators: Overall gross capital formation (investment) or specific investments (e.g. in information and communication technologies) 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.

420. TH19. Knowledge capital
Core indicators (national): The total stock of knowledge capital should be measured. Although knowledge is a 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 driver indicators: R&D investments (split into public and private) may be useful. Other indicators for innovation or patents can also be used.

421. TH20. Financial capital
Core indicators (national): The national totals of financial assets minus liabilities from the SNA can be used.
Policy driver indicators: Changes in net assets and liabilities or public debt and deficits.

422. 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.
Policy driver indicators: Investments in these capital stocks.

ANNEX V. SELECTION OF INDICATORS

423. The selection process of indicators is explained in general terms in Chapter 8. The current Annex provides more detail on the selection procedure which is based on ideal indicators, commonalities between sustainable development indicator (SDI) sets of selected countries, and data availability. The description of the 'ideal' indicators for the selected themes is provided in Annex IV. A summary of data availability is given in Annex VII.

424. The TFSD proposes three indicator sets: two large sets of 60 and 90 indicators respectively; and one small set of 24 indicators. In total, 94 unique indicators are used in one or more of the indicator sets proposed by the Task Force. See Annex VI for the list and description of indicators belonging to the three sets.

Commonalities

425. The TFSD analysed the SDI sets used by countries/institutes that are members of the TFSD to identify the most commonly used indicators for the specific themes and sub-themes of sustainable development. 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 mainly focused on other concepts such as Australia's Measures of Progress or the OECD's How's Life? indicators are not included here.

426. The SDI sets of the following countries and organisations have been analysed (the abbreviations given in brackets are used in Table V):

- 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)

Selection of indicators in the large sets

427. As a first step in the selection procedure, the most common sub-themes for each of the 20 themes are identified. Columns 5-15 in the table show whether indicators on the specific sub-themes are present in SDI sets of the analysed countries/institutions. The selection criteria for the sub-themes are provided in column 16 and the selected sub-themes are marked X in the commonalities column (18) .

428. As the first selection criterion is 'ideal' indicators, some sub-themes are included for conceptual reasons even though they are rarely present in the SDI sets reviewed. In other cases, sub-themes that are quite common in the SDI sets were excluded. The reasons for the exceptions are explained in column 16.

429. Data availability is not a criterion in the selection of indicators in the large sets. As a result, if an indicator is not available in international databases, a 'place holder' is included.

Selection of indicators in the small set

430. The 24 indicators of the small set are derived from the 90 indicators included in the large set (thematic categorisation).

431. First, for each of the 20 themes, one indicator is chosen as an aggregate indicator at national level. The most important criterion is data availability.

432. If several indicators are available per theme, then the selection is based on commonalities. In most cases, the selected indicator was based on the most commonly used sub-theme in the SDI sets reviewed. In three cases, one of the most common indicators for the theme was used (energy consumption for the theme 'energy resources', domestic material consumption for 'non-energy resources', and water abstractions for 'water').

433. In four cases, conceptual considerations 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 to 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 'lifelong 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 is conceptually more suitable for the measurement of social capital.

434. 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 on distribution (income inequality and gender pay gap) are added to the small set bringing the total up to 24 indicators.

Table V. Selecting the indicators based on commonalities between ten indicator sets, ideal indicators and data availability

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
TH1. Subjective well-being	Life satisfaction	Life satisfaction								X		X	X	3		X	X		X	1. Life satisfaction
TH2. Consumption and income	Consumption	Final consumption expenditure			X					X	X			3	Sub-themes that are used by at least six of the ten institutes. Exceptions: The Stiglitz-Sen-Fitoussi report recommended the use of consumption and income indicators. The sub-theme for "Consumption" is therefore included although only few countries include this indicator in their sets.	X		X		2. Final consumption expenditure
	Income	National income	Disposable income (NZL) Household income (CHE)		X		X		X		X	X		5						
	Savings	Gross savings	Net savings (UNCSD) Household saving rate (Eurostat)	X	X									2						
	Gross Domestic Product	Gross Domestic Product (GDP)		X	X		X	X		X			X	6		X	X	X		3. Gross Domestic Product (GDP) per capita
	Productivity	Labour productivity	Output per worker (GBR)	X	X					X	X	X	X	6		X	X	X		4. Labour productivity
	Competitiveness	Unit labour costs	Real effective exchange rate (Eurostat) Diversity of exports (NZL)	X	X						X			3						
	Official Development Assistance	Official Development Assistance	ODA to poor countries (CHE), ODA by income group, Untied ODA, bilateral ODA by category, Total EU financing for developing countries, ODA per inhabitant (Eurostat)	X	X		X	X	X	X		X	X	8		X	X	X		5. Official Development Assistance (ODA)
	Remittances	Remittances as percentage of GNI		X						X		X		3						
	Imports from developing countries	Imports from LDCs/developing countries	Fair trade (CHE)	X	X			X	X	X		X		6		X	X	X		6. Imports from developing countries
	Trade barriers	Average tariff barriers imposed on exports from developing countries and LDCs	Duty-free imports from developing countries (CHE) Aggregated measurement of support for agriculture (Eurostat)	X	X							X		3						
	Distribution-Income-Total	Income inequality	Poverty rate (FRA), Population living below national poverty line (UNCSD, CHE), Persons at-risk-of-poverty after social transfers, Persistent-at-risk-of-poverty rate, Relative median at-risk-of-poverty gap (Eurostat), Poverty in living conditions (FRA), Proportion of population below $ 1 a day (UNCSD), Severely materially deprived persons (Eurostat), Ratio of share in national income of highest to lowest quintile (UNCSD, NLD), Number of households heavily in debt (FRA), Population with low incomes (NZL)	X	X		X		X	X	X	X		7		X	X	X		7. Income inequality

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Distribution-Income-Labour status	Working poor	In work at-risk-of-poverty rate (Eurostat)		X							X		2						
	Distribution-Income-Gender	Gender pay gap/Gender income inequality	Persons at-risk-of-poverty after social transfers, by gender (Eurostat)		X		X	X		X		X		5		X	X	X		8. Gender pay gap/Gender income inequality
	Distribution-Income-Ethnicity	Pay equality by ethnicity									X			1						
	Distribution-Income-Age	Children in relative low-income households	Pensioners in relative low-income households (GBR), At-risk-of-poverty rate, by age group, At-risk-of-poverty rate of elderly people (Eurostat)		X								X	2						
	Distribution-Income-Household type	At-risk-of-poverty rate, by household type			X									1						
	Distribution-Income-Education	At-risk-of-poverty rate, by highest level of education attained			X									1						
	Distribution-Income-Regional	Dispersion of regional GDP per inhabitant			X									1						
	Subjective	Satisfaction with material/financial situation	Satisfaction with income inequality (NLD) , Attitude towards development assistance (CHE)							X	X	X		3						
TH3. Nutrition	Obesity	Proportion of obese people	Childhood obesity (GBR)	X	X			X		X	X	X	X	7	Sub-themes that are used by at least six of the ten institutes.	X	X	X		9. Obesity prevalence (for some countries, malnutrition may be selected)
	(Mal)nutrition	Nutritional status of children	Consumption of certain foodstuffs per inhabitant (Eurostat), Proportion of people consuming a healthy diet (GBR)	X										1						
TH4. Health	Life expectancy	Life expectancy at birth	Life expectancy at age 65 (Eurostat)	X	X		X		X	X				5	Sub-themes that are used by at least five of the ten institutes	X	X	X		10. Life expectancy at birth
	Healthy life expectancy	Health life expectancy at birth	Health life expectancy at age 65 (Eurostat)	X	X		X			X	X	X	X	7		X	X	X		11. Healthy life expectancy at birth
	Mental health	Suicide death rate	Prevalence of psychological distress (NZL), Mental well-being (FRA, NLD, CHE)	X	X		X			X	X	X	X	7		X	X	X		12. Suicide death rate
	Health expenditures	Health expenditures	Expenditure on care for the elderly (Eurostat)		X					X		X		3	Exception: The sub-theme is included because investment in health is an important policy driver.	X		X		13. Health expenditures
	Health care facilities	Percent of population with access to primary health care facilities	Unmet healthcare needs (UNCSD, FRA), Avoidable hospital admissions (ZNL)	X			X				X			3						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Contraception	Contraceptive prevalence rate		X										1						
	Immunization	Immunization against infectious childhood diseases		X							X			2						
	Mortality	Under-five mortality rate		X				X						2						
	Circulatory diseases	Death rates from circulatory disease											X	1						
	Cancer	Death rates from cancer									X		X	2						
	Chronic diseases	Death rate due to chronic diseases, by gender			X									1						
	HIV/malaria etc.	Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis		X										1						
	Road accidents	People killed in road accidents			X								X	2						
	Work related ailments	Serious accidents at work	Occupational diseases (FRA)		X		X							2						
	Smoking	Smoking prevalence		X				X		X			X	4		X	X	X		14. Smoking prevalence
	Drinking water	Population with drinking water supply meeting standards		X							X			2						
	Sanitation	Proportion of population using an improved sanitation facility	Population connected to urban waste water treatment with at least secondary treatment (Eurostat)	X	X									2						
	Lifestyle/Exercise	Prevalence of healthy lifestyles	Health-relevant behaviour: physical exercise (GBR)								X	X		2						
	Distribution-Health	Self-reported met need for medical examination or treatment, by income quintile	Suicide death rate, total by age group (Eurostat, GBR)		X								X	2	Exception: the sub-theme is included because the distribution of health outcomes is an important aspect of inequality.	X				15. Distribution-health
	Subjective	Perceived health								X				1						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
TH5. Labour	Employment	Employment rate	Employment rate (Eurostat, DEU), Participation rate (NLD; NZL); Disability pensioners and persons receiving work assessment allowance as a percentage of the population (NOR)	X	X			X	X	X	X		X	7	Sub-themes that are used by at least three of the ten institutes.	X	X	X		16. Employment rate
	Labour force	Labour force								X				1						
	Hours worked	Hours worked								X				1	Exception: The sub-theme is included because it is important for both economic production and to provide insights into people's work-life balance.	X		X		17. Hours worked
	Un(der)employment	Unemployment rate	Long-term unemployment rate (Eurostat, FRA); Under-employment rate (FRA); Vulnerable employment (UNCSD)	X	X		X			X	X	X	X	7	Exception: the sub-theme is excluded as it overlaps with the sub-theme on "employment rate".					
	Retirement	Average exit age from the labour market	Dependency ratio (UNCSD, Eurostat); Aggregate replacement ratio (Eurostat)	X	X					X				3		X	X	X		18. Average exit age from the labour market
	Unpaid work	Formal paid work outside the home									X			1						
	Brain drain	Brain drain								X				1		X				21. Migration of human capital
	Other	All-day care provision for children						X						1						
	Distribution-Labour-Gender	Employment rate, by gender	Share of women in wage employment in the non-agricultural sector (UNCSD); Unemployment rate, by gender (Eurostat); Professional position by gender (CHE)	X	X							X		3		X	X	X		19. Female employment rate
	Distribution-Labour-Age	Youth unemployment rate	Employment rate of older workers , unemployment rate by age group (Eurostat); Senior citizens' employment rate (FRA)		X		X					X		3		X	X	X		20. Youth employment rate
	Distribution-education	Employment rate, by highest level of education attained			X									1						
	Distribution-region	Dispersion of regional employment rates, by gender			X									1						
	Distribution-overall	Population living in workless households: children	Population living in workless households: working age (GBR); Persons living in households with very low work intensity (Eurostat)	X	X								X	2						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
TH6. Education	Educational attainment	Educational attainment level of adults		X					X	X	X			4	Sub-themes that are used by at least two of the ten institutes.	X	X	X		22. Educational attainment
	Education expenditures	Education expenditures			X					X				2		X	X	X		23. Education expenditures
	Basic competencies	Maths skills	Adult literacy rate (UNCSD, NZL); Reading skills of 15-years-olds (Eurostat, FRA, CHE)	X	X		X	X		X	X	X		7		X	X	X		24. Competencies
	Participation in education	25-year-old university graduates	Gross intake ratio to last grade of primary education, Net enrolment rate in primary education (UNCSD); Participation in tertiary education (NZL, CHE); Early school-leavers (Eurostat, FRA, DEU, NLD, CHE, GBR); Education level of young people (NLD, GBR); Access to early childhood education (NZL)	X	X		X	X		X	X	X	X	8		X	X	X		25. Early school-leavers
	Lifelong learning	Lifelong learning		X	X		X			X				4		X	X	X		26. Lifelong learning
	Knowledge of SD	Barometer of knowledge by households of the notion of sustainable development					X							1						
	Distribution-Education	Early school leavers by citizenship	Foreign school leavers with a school leaving certificate (DEU); Reading skills of 15-year-olds by socio-economic background (CHE); Persons with low educational attainment, by age group (Eurostat); Proportion of higher diplomas among the 25-34 age group and comparison with the 25-64 age group (FRA)		X		X	X				X		4	Exception: The sub-theme is included because it is an important aspect of inequality.	X				27. Distribution-education
	Subjective-educational attainment	Satisfaction with own education								X				1	Exception: the sub-theme has been excluded. See "Housing" theme for the explanation.					
TH7. Housing	Housing stock	Housing/Dwelling stock								X			X	2	Sub-themes that are used by at least two of the ten institutes.	X	X			*28. Housing stock*
	Housing density	Average density of new housing											X	1						
	Investments in housing	Increase in land use for housing and transport						X						1	Exception: conceptually preferred indicator selected over most common indicator.	X				*29. Investment in housing*

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Quality of housing	Living without housing deprivation	Vulnerable households in the private sector in homes below the decent homes standard, Social sector housing (GBR)							X			X	2		X	X	X		30. Living without housing deprivation
	Slums/rough sleepers	Number of rough sleepers	Number of households in temporary accommodation (GBR)										X	1						
	Neighbourhood	Problems in the neighbourhood								X				1						
	Housing affordability	Housing affordability									X			3		X	X			*31. Housing affordability*
	Housing costs	Housing costs	Total share of housing costs (tenants and owner-occupiers), Average monthly rent (NLD)							X		X		2						
	House price	Average house price								X				1						
	Distribution-Housing	Distribution-housing													Exception: the sub-theme is included because it is an important aspect of inequality.					
	Subjective-Quality of housing	Satisfaction with housing	Not enough space (NLD)							X			X	2	Exception: although the sub-theme "Subjective" includes interesting information, it has been excluded (see the section on "future research" for an explanation of how the system might benefit from an expansion towards subjective indicators).						
	Subjective-Affordability	Perceived housing costs								X				1						
	Subjective-Neighbourhood	Satisfaction with residential environment								X				1						
TH8. Leisure	Time use	Leisure time								X				1		X	X	X		32. Leisure time
	Subjective	Satisfaction with leisure time								X				1	The sub-theme "Subjective" has been excluded. See "Housing" theme for the explanation.					
TH9. Physical safety	Crime	Deaths from assault/homicide rate	Violent crime (CHE); Crime survey and record crime for vehicles (GBR); Crime survey and record crime for domestic burglary (DEU, GBR); Crime survey and record crime for robbery (GBR); Reported crime, Registered crime (NLD)	X			X	X		X	X	X	X	7	Sub-themes that are used by at least eight of the ten institutes.	X	X	X		33. Death by assault/homicide rate
	Suspects/prisoners	Underage suspects	Number of prisoners (NLD)							X				1						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Safety expenditures	Safety expenditures								X				1	Exception: the sub-theme is included because investment in public safety is an important policy driver.	X				34. Expenditures on safety
	Police	Number of police officers								X				1						
	Natural hazards	Human and economic loss due to natural disasters	Flooding (GBR); Percentage of population living in hazard prone areas (UNCSD)	X									X	2						
	Subjective-trust	Trust in the police	Trust in the justice system (DEU, NLD)					X		X				2						
	Subjective-crime	Not feeling safe	Impact of fear of crime on quality of life (DEU, NZL); Fear of crime: car theft, burglary, physical attack (GBR);Fear of terrorist attacks (NLD)					X		X	X		X	4						
TH10. Land and ecosystems	Land	Population density								X		X		2	Sub-themes that are used by at least five of the ten institutes. Exception: sub-theme on "Land" included for conceptual reasons. Exception: conceptual preferred indicator (land assets) preferred over most common indicator (population density which equals population per unit of land).	X				*35. Land assets*
	Land use	Land use change	Area of land used for farming (NZL); Built-up areas (Eurostat); Land use for settlement (CHE); Area covered by agriculture, woodland, water or river, urban (GBR); Livestock density index (Eurostat); New dwellings built on previously developed land or through conversions (GBR); All new development on previously developed land (GBR); Irreversible losses of biologically productive areas (NOR); Arable and permanent cropland area (UNCSD; CHE)	X	X				X		X	X	X	6	Exception: the TF excluded the sub-theme on "Land use", because its interpretation is often problematic.					
	Organic farming	Organic farming	Area for agri-environmental commitment (Eurostat)	X	X		X							3						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Protected areas	Proportion of terrestrial area protected, total and by ecological region	Nature reserves, State of preservation (NLD); Management effectiveness of protected areas (UNCSD); Sufficiency of sites designated under the EU Habitats directive (Eurostat); Land covered by environmental schemes (GBR); Area of native land cover (NZL)	X	X					X	X		X	5		X	X	X		36. Protected areas
	Landscape quality	Landscape fragmentation	Landscape quality (DEU)									X		1						
	Soil quality	Nitrogen surplus and Phosphorus surplus	Contaminated soil sites (NZL); Soil health (NZL); Land degradation, Land affected by desertification (UNCSD); Changes in soil artificialisation (FRA); Versatile soil extinction (NZL); Area of sensitive habitats exceeding critical loads for acidification and eutrophication (GBR); Hill country erosion (NZL)	X			X			X	X		X	5		X	X	X		37. Nutrient balance
	Emissions to soil	Use of pesticides	Fertilizer use efficiency (UNCSD)	X			X							2	Exception: conceptually preferred indicator about generic emission to soil selected over most common indicator	X				*38. Emissions to soil*
	Terrestrial ecosystems	Bird index	Priority species status (GBR); Priority habitat status (GBR); Abundance of selected key species (UNCSD); Species diversity (DEU); Distribution of selected native species (NZL); Area of selected key ecosystems (UNCSD); Distribution of selected pest animal and weed species (NZL); Abundance of invasive alien species, Fragmentation of habitats (UNCSD)	X	X		X	X	X	X	X	X	X	8		X	X	X		39. Bird index
	Threatened species	Number of threatened species	Change in threat status of species (UNCSD); Population Red List species, Population not Red List species (NLD)	X						X	X			3	Exception: included for conceptual reasons.	X		X		40. Threatened species
	Forests	Proportion of land area covered by forests	Percent of forest trees damaged by foliation (UNCSD, Eurostat); Area of forest under sustainable forest management (UNCSD); Forest increment and fellings, Deadwood (Eurostat); Ecological quality of forests (CHE)	X	X							X		3						
	Aquatic/Marine Ecosystems	Proportion of fish stocks within safe biological limits	Fish catches taken on stocks outside safe biological limits, Size of fishing fleet (Eurostat); Area of coral reef ecosystems and percentage live cover (UNCSD); Proportion of catches at EU level only based on the state of fishery stocks (FRA); Proportion of assessed	X	X		X		X		X		X	6	Exception: the TF excluded the sub-theme because this topic is country-specific.					

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability		
																		Official statistics (19)	Other (20)	
			fish stocks below target levels (NOR, NZL); Nature index, Ocean and coastal ecosystems, Nature index. Inland waters and terrestrial ecosystems (NOR); Sustainability of fish stocks around the UK (GBR)																	
	Footprint	Ecological footprint	Land use as a result of consumption/Land footprint (NLD)							X		X		2	Exception: included for conceptual reasons.	X				*41. Land footprint (foreign part)*
	Subjective	Satisfaction with green areas								X				1						
TH11. Water	Resources	Water resources													Sub-themes that are used by at least three of the ten institutes. Exception: "Water resources" is included for conceptual reasons.	X		X		42. Water resources
	Abstraction	Surface- and groundwater abstraction			X					X			X	3		X	X	X		43. Water abstractions
	Consumption	Proportion of total water resources used	Litres per person per day (GBR)	X									X	2						
	Allocation	Water allocation compared with total water resource									X			1						
	Intensity	Water use intensity		X										1						
	Wastewater treatment	Wastewater treatment		X										1						
	Water quality	Presence of faecal coliforms in freshwater	Biochemical oxygen demand in water bodies, Bathing water quality, Marine trophic index (UNCSD); Biochemical oxygen demand in rivers (Eurostat); Nitrate content in groundwater, Phosphorus content in selected lakes (CHE); Synthetic indicator of surface water quality (FRA); Quality of surface water (NLD); Nitrogen in rivers and streams, Biological health of rivers and streams, Lake water quality, Groundwater quality, Bacterial pollution at coastal swimming spots, rivers and lakes (NZL); Rivers of good biological quality, Rivers of good chemical quality (GBR)	X	X		X			X	X	X	X	7		X	X			*44. Water quality index*
	Emissions to water	Emissions to water													Exception: included for conceptual reasons.	X				*45. Emissions to water*
	Water stress	Water stress											X	1						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme												Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)			Ideal indicator (17)	Commonalities (18)	Data availability		
																			Official statistics (19)	Other (20)	
	Footprint	Water footprint													Exception: included for conceptual reasons.	X				*46. Water Footprint (foreign part)*
TH12. Air quality	General air pollution	Ambient concentration of air pollutants in urban areas	Index of production of toxic chemicals, by toxicity class (Eurostat); Air pollution (CEU; NZL); Assessment of local environmental quality (GBR)	X	X			X			X		X	5	Sub-themes that are used by at least two of the ten institutes. Exception: "General air pollution" has been excluded as related indicators are already covered under the theme "air pollution".					
	PM concentration	Particulate matter concentration	Urban population exposure to air pollution by particulate matter (Eurostat, NLD)		X					X		X	X	4		X	X	X		47. Urban exposure to particulate matter
	PM emissions	Emissions of particulate matter by source sector			X								X	2		X	X	X		48. Emissions of particulate matter
	Ozone concentration	Urban population exposure to air pollution by ozone			X					X			X	3		X	X	X		49. Urban exposure to ozone
	Emissions of ozone precursors	Emissions of ozone precursors by source sector			X									1	Exception: included because it is an important policy driver.	X		X		50. Emissions of ozone precursors
	Acidifying emissions	Emissions of acidifying substances by source sector	Emissions of NOx, Emissions of NH_3, Emissions of SO_2 (NOR, GBR)		X				X	X			X	4		X	X	X		51. Emissions of acidifying substances
	Distribution	Environmental equality											X	1						
	Noise	Proportion of population living in households complaining that they suffer from noise	Persons affected by noise (CHE)		X							X		2	Exception: Excluded because it was deemed to be a local, rather than a national topic.					
TH13. Climate	State of the climate	Global surface average temperature			X						X			2	Sub-themes that are used by at least two of the ten institutes. Exception: conceptually preferred indicator (CO_2 concentration) selected over most common indicator (temperature).	X	X		X	52. Global CO_2 concentration
	Historical CO_2-emissions	Historical CO_2 emissions								X				1	Exception: included for conceptual reasons	X				*53. Historical CO_2 emissions*

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability		
																		Official statistics (19)	Other (20)	
	CO_2 emissions	Carbon dioxide emissions		X						X		X	X	4	Exception: excluded because the issues are adequately covered by the "Greenhouse gas emissions" subtheme.					
	CO_2 intensity	CO_2 intensity										X		1						
	GHG emissions	Greenhouse gas emissions	Energy-related greenhouse gas emissions (NZL)	X	X		X	X	X	X	X	X	X	9		X	X	X		54. GHG-emissions
	GHG intensity	Greenhouse gas emissions intensity of energy consumption	Greenhouse gas intensity of the economy (NLD, NZL)		X					X	X			3		X	X			55. GHG-emissions intensity
	State of the ozone layer	Ozone concentration									X	X		2		X	X		X	57. State of the ozone layer
	Ozone depleting emissions	Ozone depleting emissions		X										1		X		X		58. CFC emissions
	Footprint	Carbon footprint of the final national demand					X							1		X	X			*56. Carbon footprint (foreign part)*
	Carbon trade balance	Emission trade balance								X				1						
TH14. Energy resources	Resources	Energy resources								X				1	Sub-themes that are used by at least five of the ten institutes. Exception: "Energy resources" included for conceptual reasons	X				*59. Energy resources*
	Production	Depletion of energy resources/production								X			X	2						
	Supply	Primary energy supply									X			1						
	Consumption	Energy consumption	Electricity consumption of households (Eurostat); Energy consumption in the residential-service sector (FRA)	X	X		X			X		X	X	6		X	X	X		60. Energy consumption
	Expenditures	Household expenditure on energy used in the home									X			1						
	Intensity/productivity	Energy intensity	Energy productivity (DEU)	X	X		X	X	X	X	X	X		8		X	X	X		61. Energy intensity
	Renewable energy	Share of renewable energy	Share of renewable electricity (Eurostat, NZL, GBR)	X	X		X	X		X	X	X	X	8		X	X	X		62. Renewable energy
	Heat/Power	Combined heat and power generation			X									1						
	Tax	Implicit tax rate on energy			X									1						

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability: Official statistics (19)	Data availability: Other (20)	
	Imports	Imports of energy	Imports of energy from LDCs (NLD)							X				1	Exception: included for conceptual reasons	X		X		63. Imports of energy resources
	Energy dependence	Energy dependence		X	X						X	X	X	5		X	X	X		64. Energy dependency
	Distribution	Households living in fuel poverty containing pensioners	Households living in fuel poverty containing children, Households living in fuel poverty containing disabled/long-term sick (GBR); Share of households without electricity or other modern energy services, Percentage of population using solid fuels for cooking (UNCSD)	X									X	2						
TH15. Non-energy resources	Resources	Non-energy resources													Sub-themes that are used by at least four of the ten institutes. Exception: "Non-energy resources" included for conceptual reasons	X				*65. Non-energy resources*
	Extraction	Extraction																		
	Consumption	Domestic material consumption	Total material requirement (CHE)	X	X		X					X	X	5		X	X	X		66. Domestic material consumption
	Intensity/Productivity	Material intensity of economy	Resource productivity (Eurostat, FRA, DEU)	X	X		X	X				X		5		X	X	X		67. Resource productivity
	Waste	Generation of waste	Non-mineral waste generation (Eurostat); Generation of waste (UNCSD, FRA); Waste treatment and disposal (UNCSD); Household waste (GBR)	X	X		X					X	X	5		X	X	X		68. Generation of waste
	Hazardous waste	Generation of hazardous waste	Management of radioactive waste (UNCSD); Nuclear waste (FRA)	X	X		X							3						
	Landfill	Total waste on all sectors disposed of in landfill sites	Solid waste disposed of to landfill (NZL)								X		X	2						
	Recycling	Waste recycling rate	Proportion of population with access to kerbside recycling, Proportion of packaging waste recycled (NZL); Household waste recycled or composted (GBR)				X				X	X	X	4		X	X	X		69. Recycling rate
	Imports	Material requirement abroad for imports to Switzerland	Imports of minerals, Imports of biomass, Imports of minerals from LDCs, Imports of biomass from LDCs (NLD)							X		X		2	Exception: included for conceptual reasons	X		X		70. Imports of non-energy resources

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability		
																		Official statistics (19)	Other (20)	
TH16. Trust	Generalised trust	Generalised trust								X				1	Sub-themes that are used by at least four of the ten institutes.	X			X	71. Generalised trust
	Bridging social capital	Feelings of discrimination	Opinions about immigrants (NLD)							X				1	Exception: included for conceptual reasons	X				*72. Bridging social capital*
	Family/Friends	Contact with friends/family	Satisfaction with family life (NLD)							X				1	Exception: included for conceptual reasons	X			X	73. Contact with family and friends
	Voluntary work	Voluntary work	Participation in associative life (FRA)				X			X		X	X	4	Exception: included for conceptual reasons	X	X		X	74. Participation in voluntary work
	Culture	Own cultural activities	Participation in cultural activities (CHE);									X		1						
	Language	Children attending Māori language immersion schools	Speakers of the reo Māori, Local content on New Zealand television (NZL); Regular use of a second national language (CHE)								X	X		2						
	Monuments	Number of historic places	Trend in standard of maintenance of protected buildings (NOR)						X		X			2						
TH17. Institutions	Voter turnout	Voter turnout in elections			X		X			X	X			4	Sub-themes that are used by at least two of the ten institutes.	X	X	X		75. Voter turnout
	Trust in institutions	Trust in government institutions	Level of citizens confidence in EU institutions (Eurostat)		X					X	X			3		X	X	X		76. Trust in institutions
	Corruption	Percentage of population having paid bribes		X										1						
	International institutions	Multilateral treaties										X		1						
	Law	New infringement cases	Transposition of Community law, by policy area (Eurostat)		X									1						
	E-government	E-government on-line availability	E-government usage by individuals (Eurostat)		X									1						
	Social justice	Social justice											X	1						
	Distribution-services	Access to key services											X	1						
	Distribution-Institutions-Gender	Women in the national council									X	X		2		X	X	X		77. Percentage of women in parliament
	Global social capital	International institutions													Exception: included for conceptual reasons	X				*78. Contribution to international institutions*
TH18. Physical capital	Capital stock	Capital stock								X	X			2	Sub-themes that are used by at least seven of the ten institutes. Exception: "Capital stock" included for conceptual reasons	X		X		79. Capital stock
	Investment	Gross fixed capital	Social investments (GBR)	X	X			X		X	X	X	X	7		X	X	X		80. Gross capital formation

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability		
																		Official statistics (19)	Other (20)	
		formation																		
	ICT	ICT expenditures	Internet users, Mobile cellular telephone users, Fixed telephone lines (UNCSD)	X						X				2						
	Distribution-income	Internet use by income group										X		1						
	Infrastructure	Real net stock of infrastructure per person									X			1						
	Export	Exports of physical capital													Exception: included for conceptual reasons	X		X		81. Exports of physical capital
TH19. Knowledge capital	Capital stock	R&D capital stock								X				1	Sub-themes that are used by at least four of the ten institutes. Exception: "R&D capital stock" included for conceptual reasons	X				82. R&D capital stock
	Investment	Total R&D expenditures		X						X	X	X		4		X	X	X		83. R&D expenditures
	Innovation	Turnover from innovation	Rate of innovation by type (NZL)		X						X			2						
	Patents	Patent applications								X		X		2						
	Scientific articles	Scientific articles								X				1						
	R&D personnel	Personnel involved in research and development	Human resources in science and technology (CHE)							X	X	X		3						
	Knowledge spillovers	Knowledge networks								X				1	Exception: included for conceptual reasons	X		X		84. Knowledge spillovers
	Exports of knowledge capital	Exports of knowledge capital														X				85. Exports of knowledge capital
TH20. Financial capital	Net assets/liabilities	Net foreign assets/liabilities								X				1	Sub-themes that are used by at least three of the ten institutes. Exception: "Net assets/liabilities" included for conceptual reasons	X		X		86. Assets minus liabilities
	Debt	General government debt	Debt to GNI ratio (Eurostat, CHE); Indebtedness of businesses and households (FRA); Generational accounts: Need to tighten public sector finances as a share of GDP (NOR); Ratio of debt services to export earnings (NZL)	X	X		X			X	X	X		7		X	X	X		87. Consolidated government debt per GDP

Theme (1)	Sub-theme (2)	Most common indicator (3)	Other indicators used (4)	Total per sub-theme											Selection criteria for the sub-theme (16)	Selection criteria for the indicator				Selected indicator (21)
				UNCSD (5)	Eurostat (6)	WB (7)	FRA (8)	DEU (9)	NOR (10)	NLD (11)	NZL (12)	CHE (13)	GBR (14)	Total (15)		Ideal indicator (17)	Commonalities (18)	Data availability		
																		Official statistics (19)	Other (20)	
	Deficit/Surplus	Current account deficit as percentage of GDP		X				X						2		X	X	X		88. Current deficit/surplus of government
	FDI	Foreign direct investment in developing countries, by income group		X	X							X		3		X		X		90. Foreign direct investment (FDI)
	Taxes	Public sector fiscal revenue rate										X		1						
	Pensions	Pension entitlements	Pension expenditure (Eurostat); Proportion of working age people contributing to a non-state pension in at least three years out of the last four (GBR)		X					X			X	3		X	X	X		89. Pension entitlements
Monetised aggregates	Economic capital	Produced capital (WB)										X		1		X	X		X	91. Economic capital
	Financial capital	Financial capital (WB)										X		1						
	Natural capital	Natural capital (WB)										X		1		X	X		X	92. Natural capital
	Human capital	Human capital (WB)										X		1		X	X		X	93. Human capital
	Intangible capital	Intangible capital (WB)										X		1						
	Total capital	Comprehensive wealth (WB)										X		1						
	Social capital														Exception: included for conceptual reasons	X				*94. Social capital*

ANNEX VI. INDICATORS BELONGING TO THE 3 SETS; DESCRIPTION OF INDICATORS

Theme (1)	Sub-theme (2)	Indicator (3)	Large set conceptual categorisation (4)	Large set thematic categorisation (5)	Small set (thematic categorisation) (6)	Indicator description (7)	Unit (8)
TH1. Subjective well-being	Life satisfaction	1. Life satisfaction	X	X	X	Response to the question "All things considered, how satisfied are you with your life as a whole nowadays? Please answer using this card, where 0 means extremely dissatisfied and 10 means extremely satisfied."	Score (0-10)
TH2. Consumption and income	Consumption	2. Final consumption expenditure per capita	X	X	X	Final consumption expenditure per capita (as defined by the System of National Accounts). Final consumption expenditure is the amount of expenditure on consumption of goods and services. (2008 SNA, 9.7)	At constant prices and PPPs of a base year (e.g. 2005) in US Dollars per capita
	Gross Domestic Product	3. GDP per capita		X		Gross Domestic Product (GDP) (as defined by the System of National Accounts)	At constant prices and PPPs of a base year (e.g. 2005) in US Dollars per capita
	Productivity	4. Labour productivity rate		X		A ratio of output per unit of labour input, e.g. total hours worked (in this case: real GDP per hours worked). Total hours worked can be counted by dividing the number of jobs with the number of average hours worked.	GDP at constant prices and PPPs in US Dollars per total hours worked
	Official Development Assistance	5. Official Development Assistance (ODA)	X	X	X	Official development assistance (ODA) as a share of gross national income. ODA consists of grants or loans that are undertaken by the official sector with promotion of economic development and welfare in the recipient countries as the main objective.	Percentage of Gross National Income
	Imports from developing countries	6. Imports from developing countries	X	X	X	Value of imports from developing countries and territories, or share of the value of imports from developing countries and territories in the total value of imports of goods and services. Imports of goods and services consist of purchases, barter, or receipts of gifts or grants, of goods and services by residents from non-residents.	At constant prices and PPPs of a base year (e.g. 2005) in US Dollars or percentage of total imports
	Distribution-Income-Total	7. Income inequality	X	X	X	Gini coefficient (after taxes and transfers) or S80/S20 income quintile share. The Gini coefficient measures the inequality among values of a frequency distribution (for example levels of income). A Gini coefficient of zero expresses perfect equality where all values are the same, and a Gini coefficient of one expresses maximal inequality among values.	Gini coefficient or S80/S20 income quintile share ratio
	Distribution-Income-Gender	8. Gender pay gap	X	X		Gender pay gap in average monthly earnings: the difference between men's and women's average earnings from employment, shown as a percentage of men's average earnings. It combines the gender differences in the wage rates as well as time worked and type of work performed.	Percentage
TH3. Nutrition	Obesity	9. Obesity prevalence	X	X		Prevalence of adults (>=15 years) who are obese (i.e. have a Body Mass Index of over 30)	Percentage of population aged 15+
TH4. Health	Life expectancy	10. Life expectancy at birth	X	X	X	Life expectancy at birth	Years
	Healthy life expectancy	11. Healthy life expectancy at birth		X		Healthy life expectancy (HALE) at birth	Years
	Mental health	12. Suicide death rate		X		Crude death rate from suicide and intentional self-harm	Deaths per 100,000 inhabitants
	Health expenditures	13. Health expenditures		X		Total expenditure on health per capita	PPP adjusted dollars per capita or Percentage of GDP
	Smoking	14. Smoking prevalence		X		Prevalence of current tobacco use among adults (>=15 years) - daily smokers	Percentage of population
	Distribution-Health	*15.Distribution-health*	X	X		*Place holder*	*Place holder*

Theme (1)	Sub-theme (2)	Indicator (3)	Large set conceptual categorisation (4)	Large set thematic categorisation (5)	Small set (thematic categorisation) (6)	Indicator description (7)	Unit (8)
TH5. Labour	Employment rate	16. Employment rate	X	X	X	The employment rate is the share of employed persons in the population aged 15-64	Percentage of population
	Hours worked	17. Hours worked		X		Average number of hours worked in a week	Hours
	Retirement	18. Average exit age from labour market		X		Average exit age from the labour force calculated on the basis of age-specific labour force withdrawal probabilities	Years of age
	Distribution-Labour-Gender	19. Female employment rate	X	X		Share of employed among women aged 15-64	Percentage
	Distribution-Labour-Age	20. Youth employment rate	X	X		Share of employed persons in the population aged 15-24	Percentage
	Migration	*21. Migration of human capital*	X	X		*Place holder*	*Place holder*
TH6. Education	Educational attainment	22. Educational attainment	X	X	X	Persons with upper secondary education aged 25-64	Percentage of population aged 25-64
	Education expenditures	23. Expenditures on education		X		Total public expenditure on education as percentage of GDP, for all levels of education combined	Percentage of GDP
	Basic competencies	24. Competencies		X		Average of Programme for International Student Assessment (PISA) scores in reading, mathematics and science, or Adult literacy rate	PISA score, or Percentage of population
	Participation in education	25. Early school leavers		X		EU definition: Proportion of population aged 18-24 with only lower secondary education or less, and no longer in education or training (the OECD definition covers the age group 20-24 year olds)	Percentage of population aged 18-24
	Lifelong learning	26. Lifelong learning		X		Participation in education and training (life-long learning), aged 18-64	Percentage of population aged 18 to 64
	Distribution-Education	*27. Distribution-education*	X	X		*Place holder*	*Place holder*
TH7. Housing	Housing stock	*28. Housing stock*		X		*Place holder*	*Place holder*
	Investments in housing	*29. Investment in housing*		X		*Place holder*	*Place holder*
	Quality of housing	30. Living without housing deprivation	X	X	X	Material deprivation for the 'Housing' dimension – answer “no items”	Percentage
	Housing affordability	*31. Housing affordability*		X		*Place holder*	*Place holder*
TH8. Leisure	Time use	32. Leisure time	X	X	X	Number of minutes per day spent on leisure	Minutes per day
TH9. Physical safety	Crime	33. Death by assault/homicide rate	X	X	X	Crude death rate due to assault	Deaths per 100 000 population (standardised rates)
	Safety expenditures	*34. Expenditures on safety*		X		*Place holder*	*Place holder*
TH10. Land and ecosystems	Land	*35. Land assets*	X	X		*Place holder*	*Place holder*
	Protected areas	36. Protected areas		X		Protected areas for biodiversity: Habitats Directive or Proportion of Protected areas: marine & terrestrial	Percentage of (marine and) terrestrial area
	Soil quality	37. Nutrient balance		X		Gross nutrient balance per hectare (arable land, permanent crops, permanent grassland)	Kilogram of nutrients per hectare
	Emissions to soil	*38. Emissions to soil*		X		*Place holder*	*Place holder*
	Species/Ecosystems	39. Bird index	X	X	X	Population estimates for common farmland bird species (36 species)	Index, 2000=100
	Threatened species	40. Threatened species		X		International Union for Conservation of Nature (IUCN) category "Total number of threatened species"	Number of species
	Footprint	*41. Land footprint (foreign part)*	X	X		*Place holder*	*Place holder*
TH11. Water	Resources	42. Water resources	X	X		Freshwater renewable resources (long term annual average)	Billion or Million cubic

Theme (1)	Sub-theme (2)	Indicator (3)	Large set conceptual categorisation (4)	Large set thematic categorisation (5)	Small set (thematic categorisation) (6)	Indicator description (7)	Unit (8)
							metres
	Abstraction	43. Water abstractions		X	X	Gross freshwater abstracted	Million cubic metres
	Water quality	*44. Water quality index*	X	X		*Place holder*	*Place holder*
	Emissions to water	*45. Emissions to water*		*X*		*Place holder*	*Place holder*
	Footprint	*46. Water footprint (foreign part)*	X	X		*Place holder*	*Place holder*
TH12. Air quality	Particulate matter concentration	47. Urban exposure to particulate matter	X	X	X	Urban particulate matter air pollution	micrograms per cubic metre
	Emissions of particulate matter	48. Emissions of particulate matter		X		Emissions of particulates (PM10) (man-made)	1000 tonnes
	Ozone concentration	49. Urban exposure to ozone		X		Urban population exposure to air pollution by ozone	Micrograms per cubic metre per day
	Ozone precursors	50. Emissions of ozone precursors		X		Emissions of non-methane volatile organic compounds (NMVOC)	Tonnes
	Acidifying emissions	51. Emissions of acidifying substances		X		Emissions of nitrogen oxides	Tonnes
TH13. Climate	State of the climate	52. Global CO_2 concentration	X	X		Globally averaged marine surface annual mean carbon dioxide (CO_2) concentration	Parts per million (ppm)
	Historical CO_2-emissions	*53. Historical CO_2 emissions*		X		*Place holder*	*Place holder*
	GHG emissions	54. GHG-emissions		X	X	Greenhouse gas emissions (CO_2 equivalent)	1000 tonnes of CO_2 equivalent
	GHG intensity	55. GHG-emissions intensity		X		Greenhouse gas emissions (CO_2 equivalent) per unit of GDP	1000 tonnes of CO_2 equivalent per unit of GDP (constant prices)
	Footprint	*56. Carbon footprint (foreign part)*	X	X		*Place holder*	*Place holder*
	State of the ozone layer	57. State of the ozone layer	X	X		The area of the ozone hole is determined from a map of total column ozone. It is calculated from the area on the Earth that is enclosed by a line with a constant value of 220 Dobson Units. The value of 220 Dobson Units is chosen since total ozone values of less than 220 Dobson Units were not found in the historic observations over Antarctica prior to 1979. Also, from direct measurements over Antarctica, a column ozone level of less than 220 Dobson Units is a result of the ozone loss from chlorine and bromine compounds.	Million km^2
	Ozone depleting substances	58. CFC emissions		X		Total emissions of chloroflourocarbons	Metric tons of ozone depleting substances weighted by their ozone depletion potential (ODP), referred to as ODP tons
TH14. Energy resources	Resources	*59. Energy resources*	X	X		*Place holder*	*Place holder*
	Consumption	60. Energy consumption		X	X	Total energy consumption per capita, or final energy consumption	Kilograms oil equivalent per capita or Thousand tonnes of oil equivalent (TOE)
	Intensity/Productivity	61. Energy intensity		X		Total primary energy consumption per unit of GDP	Kilograms oil equivalent per $1,000 (PPP) GDP or Kilogram of oil equivalent per 1000 euro (GDP=2000)

Theme (1)	Sub-theme (2)	Indicator (3)	Large set conceptual categorisation (4)	Large set thematic categorisation (5)	Small set (thematic categorisation) (6)	Indicator description (7)	Unit (8)
	Renewable energy	62. Renewable energy		X	X	Renewable electricity production, or Share of renewable energy in total final energy consumption	Percentage
	Imports	63. Imports of energy resources	X	X		Value of imports of energy resources	Constant US PPP Dollars or index (2005=100)
	Energy dependency	64. Energy dependency		X	X	Energy dependency shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers.	Percentage
TH15. Non-energy resources	Resources	*65. Non-energy resources*	X	X		*Place holder*	*Place holder*
	Consumption	66. Domestic material consumption		X	X	Domestic Material Consumption (DMC) - total amount of materials directly used by an economy; defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports.	1000 tonnes
	Intensity/Productivity	67. Resource productivity		X		Resource Productivity (GDP/DMC)	Constant US PPP Dollars per kilogram
	Waste	68. Generation of waste		X		Generation of waste (by all NACE activities plus households)	Kilograms per capita
	Recycling	69. Recycling rate		X		Share of recycled waste in total waste generated. Recycling is the processing of used or unused, sorted or unsorted, waste and scrap into secondary raw materials which can then be used by other sectors as an intermediate good.	Percentage
	Imports	70. Imports of non-energy resources	X	X		Value of imports of non-energy resources	Constant US PPP Dollars or index (2005=100)
TH16. Trust	Generalised trust	71. Generalised trust	X	X	X	Response to the question "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please tell me on a score of 0 to 10, where 0 means you can't be too careful and 10 means that most people can trusted."	Score (0-10)
	Bridging social capital	*72. Bridging social capital*	X	X		*Place holder*	*Place holder*
	Family/Friends	73. Contact with family and friends		X		Response to the question "How often do you meet socially with friends, relatives or work colleagues?": share of answers between "several times a month" to "every day"	Percentage
	Voluntary work	74. Participation in voluntary work	X	X		Response to the question "In the past 12 months, how often did you get involved in work for voluntary or charitable organisations?": share of answers between "at least once every three months" and more frequently.	Percentage
TH17. Institutions	Voter turnout	75. Voter turnout	X	X	X	Voter turnout in national parliamentary elections	Percentage of the eligible electorate
	Trust in institutions	76. Trust in institutions		X		Response to the question "On a score of 0-10 how much do you personally trust each of the institutions (Parliament, the legal system, the police, politicians, political parties, the European Parliament and the United Nations). 0 means you do not trust an institution at all, and 10 means you have complete trust."	Average score (0-10) for the institutions parliament, legal system, police and political parties.
	Distribution-Institutions-Gender	77. Percentage of women in parliament	X	X		Share of seats in the national parliament held by women	Percentage of the parliamentary seats
	Global social capital	*78. Contribution to international institutions*	X	X		*Place holder*	*Place holder*
TH18. Physical Capital	Capital stock	79. Capital stock	X	X		The stock of fixed assets (excluding Intellectual Property Products) surviving from past periods, and corrected for depreciation is the capital stock (in OECD Manual on Measuring Capital)	Index 2005 = 100

Theme (1)	Sub-theme (2)	Indicator (3)	Large set conceptual categorisa-tion (4)	Large set thematic categorisa-tion (5)	Small set (thematic categorisa-tion) (6)	Indicator description (7)	Unit (8)
	Investment	80. Gross capital formation		X	X	Gross capital formation shows the acquisition less disposal of produced assets for purposes of fixed capital formation, inventories or valuables (2008 SNA, 10.24) .	Percentage of GDP
	Exports	81. Exports of physical capital	X	X		Value of exports of capital goods	Constant US PPP Dollars or index (2005=100)
TH19. Knowledge Capital	Stock of knowledge capital	82. R&D capital stock	X	X		*Place holder*	*Place holder*
	R&D expenditures	83. R&D expenditures		X	X	Research and [experimental] development consists of the value of expenditures on creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and use of this stock of knowledge to devise new applications. (2008 SNA; 10.103)	Percentage of GDP
	Knowledge spillovers	84. Knowledge spillovers		X		Share of enterprises with technological innovation (product, process, ongoing or abandoned, except organizational or marketing innovation) which are engaged in innovation co-operation in total number of enterprises	Percentage of enterprises
	Exports	85. Exports of knowledge capital	X	X		*Place holder*	*Place holder*
TH20. Financial capital	Net assets/liabilities	86. Assets minus liabilities	X	X		Net financial assets (as defined by the System of National Accounts)	Percentage of GDP
	Government debt	87. Consolidated government debt per GDP		X	X	Government gross debt comprises all financial liabilities of general government, typically mainly in the form of government bills and bonds. Consolidation offsets liabilities of government-sector agencies and institutions held as an asset somewhere else in the government sector.	Percentage of GDP
	Deficit/Surplus	88. Current deficit/surplus of government		X		Net lending (+)/Net borrowing (-) of government sector under the EU EDP (Excessive Deficit Procedure)	Percentage of GDP
	Pensions	89. Pension entitlements	X	X		Pension entitlements show the extent of financial claims both existing and future pensioners hold against either their employer or a fund designated by the employer to pay pensions earned as part of a compensation agreement between the employer and employee. (SNA 11.107)	Constant US PPP dollars
	Foreign direct investment	90. Foreign direct investment (FDI)		X		Foreign direct investment (FDI) is an international investment within the balance of payment accounts. FDI is an international investment in which an enterprise resident in one country acquires an interest of at least 10 % in an enterprise resident in another country.	Percentage of GDP
Monetary aggregates	Economic capital	91. Economic and financial capital	X			Monetary value of economic and financial capital	Constant US PPP Dollars
	Natural capital	92. Natural capital	X			Monetary value of natural capital	Constant US PPP Dollars
	Human capital	93. Human capital	X			Monetary value of human capital	Constant US PPP Dollars
	Social capital	*94. Social capital*	X			*Place holder*	*Place holder*
Context	Population	95. Population size	X	X		Total annual average population	Number of persons

Additional suggestions for indicators from the electronic consultation on the framework in January 2013

435. This Annex provides a list of indicators selected according to the criteria explained in Annex V. There are also other ways to arrive at an indicator list, and other indicators could be selected. During the electronic consultation about the framework in January 2013, several countries suggested alternative indicators that are listed below.

436. Azerbaijan suggested additional ideal indicators: “Financial and information security (micro level)”; “Net accumulation (household level)” and “Level of pollution of water and air by other countries (via transboundary impact)”. Suggestions for additional indicators in the indicator sets: “Nutritional security - self-sufficiency of the country”; “Energy security: level of self-sufficiency of energy resources”; ”Waste reduction: level of reducing waste in production and consumption”; ”Consumption of natural capital”; ”Consumption of human capital”; ”Consumption of physical capital”; ”Investment in recovery of natural capital”; ”Investment in recovery of human capital”; “Investment in recovery of physical capital”.

437. Brazil suggested the following additional indicators: “Rate of deforestation”; “Use of pesticides”, “Forest fires and burnings”, “Access to water supply systems”, “Access to sewage collection system”, “Access to domestic solid waste collection service”, “Access to electricity”, “Sewage treatment”, “Final disposal of solid waste”, “Diseases related to inadequate environmental sanitation, such as diarrhoea”.

438. Canada suggested the following additional indicators: “Infant mortality”; “Morbidity and prevalence of major diseases such as tuberculosis, diabetes”; ”Housing conditions”; ”Employment status”;“ Income level”; ”Dependency on welfare”.

439. Ireland suggested the following additional indicators: ”Disability”; “Distribution of the payment of income taxation across society”; “Number of one-parent families”; “Pupil / teacher ratios”; “Crimes with high incidence rates”; “Private cars per capita”; “Indicators on institutions (nursing homes; orphanages; jails; homeless; etc.)”

ANNEX VII. DATA AVAILABILITY FOR 46 COUNTRIES

440. This Annex assesses the data availability of the indicators included in the three sets proposed by the TFSD.

441. A total of 94 indicators are used in at least one of the three indicator sets (see Annex VI). Table VII 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 indicators 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.

442. Table VII counts the numbers of data points available for these 46 countries since 2000. For example, 11 in a cell in Table VII indicates that annual data for this indicator are available in one of the databases for all years 2000-2010.[57]

443. The indicators that belong to the small set are provided with green background.

444. The table is used as a basis for the data availability criterion in the selection of indicators (Annex V). Although it is very difficult to draw general conclusions from the table, it does show that the availability of social and wellbeing indicators lags behind that of economic indicators (including labour and education). The data availability for European countries is higher because their data can be found in all three analysed databases (UN, OECD and Eurostat).

[57] 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 from GHG emissions and GDP data, which are both available in the analysed databases.

Table VII Data availability in the UN, OECD and Eurostat databases for the 95 TFSD indicators for 46 countries

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	1. Life satisfaction								3				4								2												2				3				4				3
Consumption and income	2. 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	
	3. 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	
	4. Labour productivity		11				11	11			11	10								11			11				11								11				11	11			11	11			11	11	
	5. Official Development Assistance	11	11			11	11	7		11	11	7								5		11	11											7						7		11	11	7				7	
	6. 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	
	7. Income inequality		2				2	10			2	10								11			2				1								6				2	7			2	9			1	11	
	8. Gender pay gap		9				9	11			7	10								11			9												11				9	11			9	11				11	
Nutrition	9. 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	10. 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	
	11. Healthy life expectancy at birth	1				1		10		1		10		1				1		3		1				1								1		6		1		6		1		10		1		6	
	12. Suicide death rate		6				10	10			2	2								10			5				8								6				10	10			7	10			10	10	
	13. 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	
	14. Smoking prevalence	1	1			1		1		1		1						1		1		1	3			1	2								1			1	1	1		1		1		1		1	
	15. Distribution-health																																															
Labour	16. 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	
	17. 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	
	18. Average exit age from labour market							6				6								5																6					9				9				9	
	19. Female employment rate	7	11			7	11	11		7	11	11		7				7		11		7	11			7	11							7		11		7	11	11		7	11	11		7	11	11	
	20. Youth employment rate							11				11								11																11					11				11				11	
	21. Migration of human capital																																															
Education	22. 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	
	23. 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	
	24. Competencies		9				9				9			2				1					7			1	9							1					9				9			1	5		
	25. Early school leavers					7		11		4		11		4				9		10						2								7		11		9		9		3		11		9		11	
	26. Lifelong learning							8				8								8																8					8				8				8	
	27. Distribution-education																																															
Housing	28. Housing stock																																														
	29. Investment in housing																																															
	30. Living without housing deprivation							7				7								5																5					7				6					
	31. Housing affordability																																															
Leisure	32. Leisure time											1								1																													1	
Physical safety	33. 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	
	34. Expenditures on safety																																															

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
Land and ecosystems	35. Land assets																																															
	36. Protected areas	8				8		8		8		8		8				8		3		8				8								8		6		8		6		8		8		6	
	37. Nutrient balance		1				1	10			1	9								9			1												4			1	10			1	10				6	
	38. Emissions to soil																																															
	39. Bird index							9				9																											9				9				7	
	40. Threatened species		1				1				1												1				1										1				1				1		
	41. Land footprint (foreign part)																																															
Water	42. Water resources		1				1			8	1												1				1							10				10	1				1			2	1		
	43. Water abstractions	2				2				8				1				10																10				10				10				10			
	44. Water quality index																																															
	45. Emissions to water																																															
	46. Water footprint (foreign part)																																															
Air quality	47. Urban exposure to particulate matter	7				7		10		7		10		7				7		9		7				7								7				7		10		7		8		7		9	
	48. Emissions of particulate matter						9																				5												8							9		
	49. Urban exposure to ozone							10				10								8																			10				9				9	
	50. Emissions of ozone precursors																																															
	51. Emissions of acidifying substances	6	10			6	10	10		6	10	10						6		10			10				7								10			6	10	10		6	10	10		6	10	10	
Climate	52. Global CO_2 concentration																																															
	53. Historical CO_2 emissions																																															
	54. 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	
	55. GHG-emissions intensity																																															
	56. Carbon footprint (foreign part)																																															
	57. State of the ozone layer																																														
	58. CFC emissions	7												7								7				7																						
Energy resources	59. Energy resources																																															
	60. Energy 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	
	61. Energy intensity	6				6		10		6		10		6				6		10		6				6								6		10		6		10		6		10		6		10	
	62. 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	
	63. Imports 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	
	64. Energy dependency							10				10								10																10						10				10			
Non-energy resources	65. Non-energy resources																																															
	66. Domestic material consumption		6				6	8			6	8								8			6												8				6	8			6	8				8	
	67. Resource productivity		6				6	8			6	8								8			6												8				6	8			6	8				8	
	68. 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	
	69. Recycling rate							10				10								5																6						7				10				6	
	70. Imports 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	

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
Trust	71. Generalised trust								3				4								2																2				3				4				3
	72. Bridging social capital																																															
	73. Contact with family and friends								3				4								2																2				3				4				3
	74. Participation in voluntary work								3				4								2																2				3				4				3
Institutions	75. Voter turnout							2				2								2															1				3				2				1	
	76. Trust in institutions							5				5								5															5				5				5				5	
	77. Percentage of women in parliament	11				11				11				11				11				11				11								11				11				11				11			
	78. Contribution to international institutions																																															
Physical capital	79. Capital stock		9				8				10												10				9																					
	80. Gross capital formation	9				10		11		10		11		11				11				10				11								9		11		10		11		10		10		11		9	
	81. Exports 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	82. Stock of knowledge capital																																															
	83. 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	
	84. Knowledge spillovers							1				1								1															1				1				1				1	
	85. Exports of knowledge capital																																															
Financial capital	86. Assets minus liabilities		11				11	11			11	11								11															11			8	11			11	11			11	11	
	87. Consolidated government debt		11				11	11			11	11								11			11				11							11			11	11			11	11			11	11	
	88. Current deficit/surplus of government	10				10		11		10		11		10				10		11		10				10								3		11		10		11		10		11			
	89. Pension entitlements		4								2												9																									
	90. Foreign direct investment (FDI)																																														
Monetary aggregates	91. Economic capital																																														
	92. Natural capital																																														
	93. Human capital																																														
	94. Social capital																																														
Context	95. Population size	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	

Table VII Data availability in the UN, OECD and Eurostat databases for the 95 TFSD indicators for 46 countries (continued)

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	1. Life satisfaction				4				4				4				3				4				1										3				2				1							
Consumption and income	2. 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	
	3. 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	
	4. Labour productivity		11	11			11	11			11	11			11	11			11	11			11												11	11			11				11	11			11		
	5. 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		
	6. 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		
	7. Income inequality		2	11			2	11			2	8			2	10			2	10			1	7											2	9			2				2	9			2		
	8. Gender pay gap		9	11			8	11			9	11				11			8	11				8											7	11							2	11			9		
Nutrition	9. 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	10. 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		
	11. 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			
	12. Suicide death rate		10	10			9	8			7	10			10	10			10	10			10	10											10	10			9				6	7			10		
	13. 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	
	14. 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		
	15. Distribution-health																																															
Labour	16. 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	
	17. 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		
	18. Average exit age from labour market			8				9				8				7				6				6												6									8						
	19. Female employment rate	7	11	11		7	10	11		7	11	11		7	11	11		7	11	11		7	11	11		7				7				7	11	11		7	11			7	11	11		7	11		
	20. Youth employment rate			11				11				11				11				11				8												11									11						
	21. Migration of human capital																																																
Education	22. 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		
	23. 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	
	24. Competencies		9				9				9			1	6				9				9			1	4			1	3				9				9				1	9				9		
	25. Early school leavers	9		11				11		8		11		3		11		9		11		5		11		3				4						9		7				6		11		1			
	26. Lifelong learning			8				8				8				8				8				7												8									8						
	27. Distribution-education																																															
Housing	28. Housing stock																																															
	29. Investment in housing																																															
	30. Living without housing deprivation			6				6				5				7				5				6												7									6						
	31. Housing affordability																																															
Leisure	32. Leisure time			1				1				1																																		1						

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
Physical safety	33. 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		
	34. Expenditures on safety																																															
Land and ecosystems	35. Land assets																																															
	36. Protected areas	8		8		8		8		8		8		8		8		8		6		8				8				8				8		8		8				8		8		8			
	37. Nutrient balance		1	10			1	9			1	9			1	9			1	9			1												1	10							1	9			1		
	38. Emissions to soil																																															
	39. Bird index			9				9				9								9																9								8						
	40. Threatened species		1				1				1				1				1				1												1				1				1				1		
	41. Land footprint (foreign part)																																															
Water	42. Water resources	6	1				1			8	1				1			10	1				1												1								1				1		
	43. Water abstractions	2				8				3				8				2				6								6				2				9								3			
	44. Water quality index																																															
	45. Emissions to water																																															
	46. Water footprint (foreign part)																																															
Air quality	47. 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			
	48. Emissions of particulate matter										9																								9								9						
	49. Urban exposure to ozone			10				10				10				7				7				3												8								10						
	50. Emissions of ozone precursors																																															
	51. Emissions of acidifying substances	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		
Climate	52. Global CO_2 concentration																																															
	53. Historical CO_2 emissions																																															
	54. 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		
	55. GHG-emissions intensity																																															
	56. Carbon footprint (foreign part)																																															
	57. State of the ozone layer																																															
	58. CFC emissions																					7				7				7								7								7			
Energy resources	59. Energy resources																																															
	60. Energy 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		
	61. Energy intensity	6		10		6		10		6		10		6		10		6		10		6		7		6				6				6		10		6				6		10		6		10	
	62. 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		
	63. Imports 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		
	64. Energy dependency			10				10				10				10				10				7												10								10						
Non-energy resources	65. Non-energy resources																																															
	66. Domestic material consumption		6	8			6	8			6	8			6	8			6	8			6												6	8							6	8			6		
	67. Resource productivity		6	8			6	8			6	8			6	8			6	8			6												6	8							6	8			6		
	68. 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		

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
	69. Recycling rate			10				10				10				10				6														10									10							
	70. Imports 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	71. Generalised trust				4				4				4				3				4				1												3				2				1				
	72. Bridging social capital																																																
	73. Contact with family and friends				4				4				4				3				4				1												3				2				1				
	74. Participation in voluntary work				4				4				4				3				4				1												3				2				1				
Institutions	75. Voter turnout			1				1				2				2				2				2										1								2							
	76. Trust in institutions			5				5				5				5				5														5								5							
	77. Percentage of women in parliament	11				11				11				11				11				11				11				10				11				11				11				11			
	78. Contribution to international institutions																																																
Physical capital	79. Capital stock		10																																		9												
	80. Gross capital formation	10		11		10		11		10		11		10		1		9		11		10				11				11				10		9		11				10		11		10			
	81. Exports 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	82. Stock of knowledge capital																																															
	83. 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	
	84. Knowledge spillovers			1				1				1								1															1								1							
	85. Exports of knowledge capital																																															
Financial capital	86. Assets minus liabilities		11	11			10	11			10	11			11	11			11	11															10				10				11	11						
	87. Consolidated government debt		11	11			11	11			11	11			11	11			11	11			11	6									11	11			11				11	11			10			
	88. Current deficit/surplus of government	9		11		10		11		10		11		10		11		10		11		10		6		10				8				10		11		10				10		11					
	89. Pension entitlements						1																												9													
	90. Foreign direct investment (FDI)																																															
Monetary aggregates	91. Economic capital																																															
	92. Natural capital																																															
	93. Human capital																																															
	94. Social capital																																															
Context	95. Population size	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		

Table VII Data availability in the UN, OECD and Eurostat databases for the 95 TFSD indicators for 46 countries (continued)

Theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				New Zealand				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	1. Life satisfaction								1								2												4				4								4				1				2
Consumption and income	2. 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		
	3. 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		
	4. Labour productivity		11					11				11			11	9				10			11				11	11			11	11			11				11	11				11			11		
	5. Official Development Assistance		11					7				7		11	11	7				7						11	11	7		11	11	7		11	11					7				5					
	6. 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			
	7. Income inequality		1					7				8			2	10				7			2				2	10			2	11			2				2	8				11					
	8. Gender pay gap		9					11				11				11				11							7	11				11			9				7	11				11					
Nutrition	9. Obesity prevalence		5			1		1		1					10			1		1		1	2				10			1	11			1	8			1	3	1		1		1			4		
Health	10. 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		
	11. 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			
	12. Suicide death rate		8					10				10			9	10				9			9				10	10			10	10			8				9	10				10				7	
	13. 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			
	14. 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			
	15. Distribution-health																																															
Labour	16. 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			
	17. 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		
	18. Average exit age from labour market							6				4				5				8								9				9								6				5					
	19. Female employment rate		11			7	11			7		11		7	10	11		7		11		7	11			7	11	11		7	11	11		7	11			7	11	11		7		11		7			
	20. Youth employment rate							11				11				11				11								11				11								11				11					
	21. Migration of human capital																																															
Education	22. 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			
	23. 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			
	24. Competencies		9			1				1					8							4	9				9				9				9				9			1				1	9		
	25. Early school leavers	9				9		9		9		11				11		5		11		9				2		11		9		11						8		10		9		11		4			
	26. Lifelong learning							8				8				8				8								8				7								8				8					
	27. Distribution-education																																															
Housing	28. Housing stock																																															
	29. Investment in housing																																															
	30. Living without housing deprivation							5				5				7				5								5				6								5				3					
	31. Housing affordability																																															
Leisure	32. Leisure time							1				1																				1								1									

Theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				New Zealand				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
Physical safety	33. 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		
	34. Expenditures on safety																																															
Land and ecosystems	35. Land assets																																																
	36. Protected areas					8		6		8		6		8		8		8		6		8				8		8						8				8		6		8		3		8			
	37. Nutrient balance		1					9				9			1	9				7			1				1	9			1	10			1			1	10			9						
	38. Emissions to soil																																															
	39. Bird index							9																				9				9						9										
	40. Threatened species		1												1								1				1				1				1				1						1		
	41. Land footprint (foreign part)																																															
Water	42. Water resources		1			8				6					1			10					1			8	1			10	1				1			10	1			10					1		
	43. Water abstractions					8				8				1				10				4				5				1				2				10				10				10			
	44. Water quality index																																															
	45. Emissions to water																																															
	46. Water footprint (foreign part)																																															
Air quality	47. Urban exposure to particulate matter	7				7		2		7		6		7		2						7				7		10		7		7		7				7		10		7		7		7			
	48. Emissions of particulate matter																						1								9								5										
	49. Urban exposure to ozone							6				6																10				2							10				6					
	50. Emissions of ozone precursors																																															
	51. Emissions of acidifying substances		9			6		10		6		10		5	10	10		7		10		1	1			6	10	10		6	10	10		6	10			6	10	10		6		10		6			
Climate	52. Global CO_2 concentration																																															
	53. Historical CO_2 emissions																																															
	54. 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		
	55. GHG-emissions intensity																																															
	56. Carbon footprint (foreign part)																																															
	57. State of the ozone layer																																														
	58. CFC emissions																					7								7				7												7			
Energy resources	59. Energy resources																																															
	60. Energy 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		
	61. Energy intensity					6		10		6		10		6		10		6		10		6				6		10		6		10		6				6		10		6		10		6			
	62. 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		
	63. Imports 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			
	64. Energy dependency							10				10				10				10								10				10							10				10					
Non-energy resources	65. Non-energy resources																																															
	66. Domestic material consumption		6					8				8				8				8			6				6	8			6	8			6				6	8				8					
	67. Resource productivity		6					8				8				8				8			6				6	8			6	8			6				6	8				8					
	68. 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		

Theme	Indicator	Korea				Latvia				Lithuania				Luxemburg				Malta				Mexico				Netherlands				Norway				New Zealand				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
	69. Recycling rate							6				6				10				4								10				4							6				5							
	70. Imports 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			
Trust	71. Generalised trust								1								2												4				4								4				1				2
	72. Bridging social capital																																															
	73. Contact with family and friends								1								2												4				4								4				1				2
	74. Participation in voluntary work								1								2												4				4								4				1				2
Institutions	75. Voter turnout							1				1				1				1								2				2							2				1							
	76. Trust in institutions							5				5				5				5								5											5				5							
	77. Percentage of women in parliament					11				11				11				11				11				11				11				11				11				11				11			
	78. Contribution to international institutions																																															
Physical capital	79. Capital stock		10																																													
	80. Gross capital formation					11		11		11		11		10		4		10		11		11				10		11		10		11		10				11		10		11		11		11			
	81. Exports 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			
Knowledge capital	82. Stock of knowledge capital																																															
	83. 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		
	84. Knowledge spillovers							1				1				1				1								1				1							1				1							
	85. Exports of knowledge capital																																															
Financial capital	86. Assets minus liabilities							11				11			5	5				7			10				11	11			11	11						11	11				11						
	87. Consolidated government debt		11					11				11			11	11				11			11				11	11			11	10			11			11	11				11						
	88. Current deficit/surplus of government					10		11		10		11		10		11		7		11		1				10		11		10		10		7				9		11		7		11		8			
	89. Pension entitlements		9																				3								9				7				6										
	90. Foreign direct investment (FDI)																																															
Monetary aggregates	91. Economic capital																																															
	92. Natural capital																																															
	93. Human capital																																															
	94. Social capital																																															
Context	95. Population size	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	

Table VII Data availability in the UN, OECD and Eurostat databases for the 95 TFSD indicators for 46 countries (continued)

Theme	Indicator	Portugal				Slovakia				Slovenia				South Africa				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	1. Life satisfaction				4				3				4								4				4				4				2				4				
Consumption and income	2. 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	
	3. 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	
	4. Labour productivity		11	11			11	11			11	11							11	11			11	11			11	9			11				11	10			11	10	
	5. Official Development Assistance	11	11	7				7				7						11	11	7		11	11	7		11	11	7				7			11	7		11	11			
	6. 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		
	7. Income inequality		2	11			1	6			1	10							2	11			2	9			2	3			1	3			2	10			2		
	8. Gender pay gap			11				11				11							5	11			9	11			8	8				1			9	11			9		
Nutrition	9. Obesity prevalence		1			1	2	1		1	1	1			3			1	4	1		1	10			1	2			1	3				10				10		
Health	10. 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		
	11. Healthy life expectancy at birth	1		10		1		5		1		5		1				1		10		1		10		1				1						8					
	12. Suicide death rate		7	10			8	10			10	10							9	10			9	10			8	8							9	10			8		
	13. 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	
	14. Smoking prevalence	1		1		1	3	1		1		1		1				1		1		1		1		1		1		1					10	1			5		
	15. Distribution-health																																								
Labour	16. 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	
	17. 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		
	18. Average exit age from labour market			6				7				4								9				9				8								9					
	19. Female employment rate	7	11	11		7	11	11		7	11	11		7				7	11	11		7	11	11		7	10	11		7	11	11			11	11			11	11	
	20. Youth employment rate			11				11				11								11				11				11				5				11					
	21. Migration of human capital																																								
Education	22. 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		
	23. 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	
	24. Competencies	1	9				9			1	5							1	9				9				9			1	6				9				9		
	25. Early school leavers			11		9		9		3		10		3				2		11		9		11				11		5						10					
	26. Lifelong learning			8				8				8								8				8				7				5				8					
	27. Distribution-education																																								
Housing	28. Housing stock																																								
	29. Investment in housing																																								
	30. Living without housing deprivation			6				5				5								6				6				2				1				5					
	31. Housing affordability																																								
Leisure	32. Leisure time											1								1																1						

Theme	Indicator	Portugal				Slovakia				Slovenia				South Africa				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
Physical safety	33. 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		
	34. Expenditures on safety																																								
Land and ecosystems	35. Land assets																																								
	36. Protected areas	8		8		8		6		8		6		8				8		8		8		8		8				8						8		8			
	37. Nutrient balance		1	9			1	10				9							1	9			1	10			1	9			1				1	10			1		
	38. Emissions to soil																																								
	39. Bird index																			9				9				9										9					
	40. Threatened species		1				1				1								1				1				1				1				1				1		
	41. Land footprint (foreign part)																																								
Water	42. Water resources	8	1			8	1			9	1			1				6	1			10	1			8	1			2	1				1				1		
	43. Water abstractions	1				7				8				1				9				8				7				2								1			
	44. Water quality index																																								
	45. Emissions to water																																								
	46. Water footprint (foreign part)																																								
Air quality	47. Urban exposure to particulate matter	7		10		7		10		7		8		7				7		10		7		10		7		10		7		2		7		10					
	48. Emissions of particulate matter		9				9				9								9								9								9				9		
	49. Urban exposure to ozone			10				10				10								10				10				10								10					
	50. Emissions of ozone precursors																																								
	51. Emissions of acidifying substances	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		
Climate	52. Global CO_2 concentration																																								
	53. Historical CO_2 emissions																																								
	54. GHG-emissions	9	10	10		9	10	10		9	10	10						9	10	10		9	10	10		9	10	10		9	10	10			10	10		9	10		
	55. GHG-emissions intensity																																								
	56. Carbon footprint (foreign part)																																								
	57. State of the ozone layer																																								
	58. CFC emissions													7												7				7								7			
Energy resources	59. Energy resources																																								
	60. Energy 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		
	61. Energy intensity	6		10		6		10		6		10		6				6		10		6		10		6		10		6		10				10		6		10	
	62. 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		
	63. Imports 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		
	64. Energy dependency			10				10				10								10				10				10				10				10					
Non-energy resources	65. Non-energy resources																																								
	66. Domestic material consumption		6	8			6	8				8							6	8			6	8			6	8			6	8			6	8			6		
	67. Resource productivity		6	8			6	8				8							6	8			6	8			6	8			6	8			6	8			6		
	68. 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		

Theme	Indicator	Portugal				Slovakia				Slovenia				South Africa				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
	69. Recycling rate			10				7				6								10				10										10							
	70. Imports 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	71. Generalised trust				4				3				4								4				4				4				2				4				
	72. Bridging social capital																																								
	73. Contact with family and friends				4				3				4								4				4				4				2				4				
	74. Participation in voluntary work				4				3				4								4				4				4				2				4				
Institutions	75. Voter turnout			2				2				2								1				1				1				1				2					
	76. Trust in institutions			5				5				5								5				5								5				5					
	77. Percentage of women in parliament	11				11				11				11				11				11				11				11								11				
	78. Contribution to international institutions																																								
Physical capital	79. Capital stock										10												7																9			
	80. Gross capital formation	10		11				11		10		11		11				10		10		10		11		10		10		11						10		10				
	81. Exports 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	82. Stock of knowledge capital																																								
	83. 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	
	84. Knowledge spillovers			1				1				1								1				1																	
	85. Exports of knowledge capital																																								
Financial capital	86. Assets minus liabilities		11	11			11	11			10	10							11	11			11	11				10								11					
	87. Consolidated government debt		11	11			11	11			8	11							11	11			11	11			11				11	9			11	11			11		
	88. Current deficit/surplus of government	10		11				11		10		11		10				10		11				11		9				4		9				11		10			
	89. Pension entitlements		8																9				9																9			
	90. Foreign direct investment (FDI)																																								
Monetary aggregates	91. Economic capital																																								
	92. Natural capital																																								
	93. Human capital																																								
	94. Social capital																																								
Context	95. Population size	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	

ANNEX VIII. COMMUNICATION OF SDI SETS IN THE CONTEXT OF OFFICIAL STATISTICS

445. Annex VIII focuses on the communication of sustainable development indicators in the context of Fundamental Principles and quality standards of official statistics.

446. 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.

447. 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.

VIII.1. Fundamental Principles of Official Statistics

448. When thinking about how to communicate sustainable development indicators, the United Nations Fundamental Principles of Official Statistics (Table IX), provide useful guidance. Good practices 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.[58]

Table VIII. 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.

[58] In addition to the United Nations principles of official statistics, one can also consider the EU Statistics code of practice, the 2011 version of which is available at: http://epp.eurostat.ec.europe.eu/portal/page/portal/quality/

VIII.2. Statistical quality and communication and interpretation of SDI sets

449. This section focuses on the importance of statistical quality in communication and interpretation of SDI sets. Different quality aspects, such as relevance, coherence and consistency, interpretability and accuracy are considered.

450. *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 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.

451. 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 to make the indicators more accessible.

452. Relevance also involves a degree of research into understanding the audience for the statistics and how they use the information eventually communicated. Statistical offices can approach this in several ways. Policymakers are regularly targeted as a key group for engagement, as a key purpose of the sustainable development indicators is to support policy decision-making and monitoring.

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

454. 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.

455. Engagement with users can be undertaken in several ways. With the advent of websites in particular, reaching a large audience through social networking and 'Wikis' is not as prohibitive in terms of cost as it was before.

456. Workshops and focus groups are also a useful way to get direct feedback on different aspects of 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.

457. These methods all aim 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 key influencers.

458. 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.

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

460. 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.

461. *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 required to enable the statistics to be interpreted correctly. 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.

462. 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 sections in their reports relating to interpretation, sources and methods. Ideally, countries will also make available the data used to compile the report through various means.

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

464. The conceptual framework provides the definition of 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.

465. 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 in 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.

466. 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).

However, whether a given change is regarded as good or bad involves value judgements on which it is often difficult to agree. 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.

Conclusion

467. The communication of official statistics has changed remarkably over the past twenty years, with new technologies enabling new products and new ways of communicating. Two good sources 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, discussed in Chapter 9 of the Report. 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 IX. EXAMPLES OF VISUALISATION TOOLS USED FOR COMMUNICATING SUSTAINABLE DEVELOPMENT INDICATOR SETS

468. This Annex presents examples of SDI sets currently available, focusing on communication and visualisation tools produced by some of the organisations represented in the TFSD.

469. The following indicator sets are included in the Annex:

- National Sustainable Development Strategy Indicators in France
- Sustainability Monitor for the Netherlands
- The sustainable development indicator system MONET in Switzerland
- Indicators used in the context of the OECD's Better Life Initiative

IX.1. France: National Sustainable Development Strategy Indicators

470. France uses a thematic categorisation (according to the nine challenges of the National Sustainable Strategy) to present its sustainable development indicator set. This presentation was preferred to a conceptual basis as it is easier to involve stakeholders. It also increases the likelihood that the communication of the indicator set will be successful. Indeed, as intended under the Grenelle Environment Planning Act, the indicator set to monitor the Sustainable Development Strategy was adopted in 2010 in a large participative process involving various stakeholders: state, local authorities, businesses, social partners and NGOs. An advisory committee, made up of representatives from these various bodies, prepared the proposals, which were debated during a national conference introduced by the State Minister, with more 450 participants. However, statisticians continue to guarantee the statistical quality of these indicators and validated the selection of indicators during the participatory process. This validation is based on the conceptual framework developed in this report.

471. Two levels of indicators were selected: 15 headline indicators relating directly to the issues covered by the strategy (level 1), 4 economic and social context indicators and 35 additional indicators relating to strategic choices (level 2). This made it possible to construct a small set based on key indicators, which is easier to communicate, and a larger set to monitor the strategy in more detail. It also made choices easier during the selection of indicators, in cases where participants did not agree on the indicators to be used.

472. This participatory process to select the indicators also contributed to improving the communication of the indicator set. The statistics are all the more valuable if they are readily accessible and are presented in a user-friendly form. The advisory committee, which was not composed of only technical experts, ensured that the communication of the indicator set is broad and takes place in a language accessible to everyone: easy to understand graphics, comment cards for each indicator with a reminder of its context, objectives of the strategy and an analysis of the indicator's evolution.

473. A summary sheet is established for each indicator in consultation with the advisory committee, and this is validated during the national conference. This sheet consists of a summary of the evolution of the indicator, a graph showing developments in France and Europe (if available), a paragraph on the position of this indicator in the strategy, a brief analysis, and useful links for more information. Lastly, a glossary provides definitions for non-usual terms used in the sheets. At the moment, a short narrative sheet is preferred to a visual symbol that can hide the complexity of interpretation.

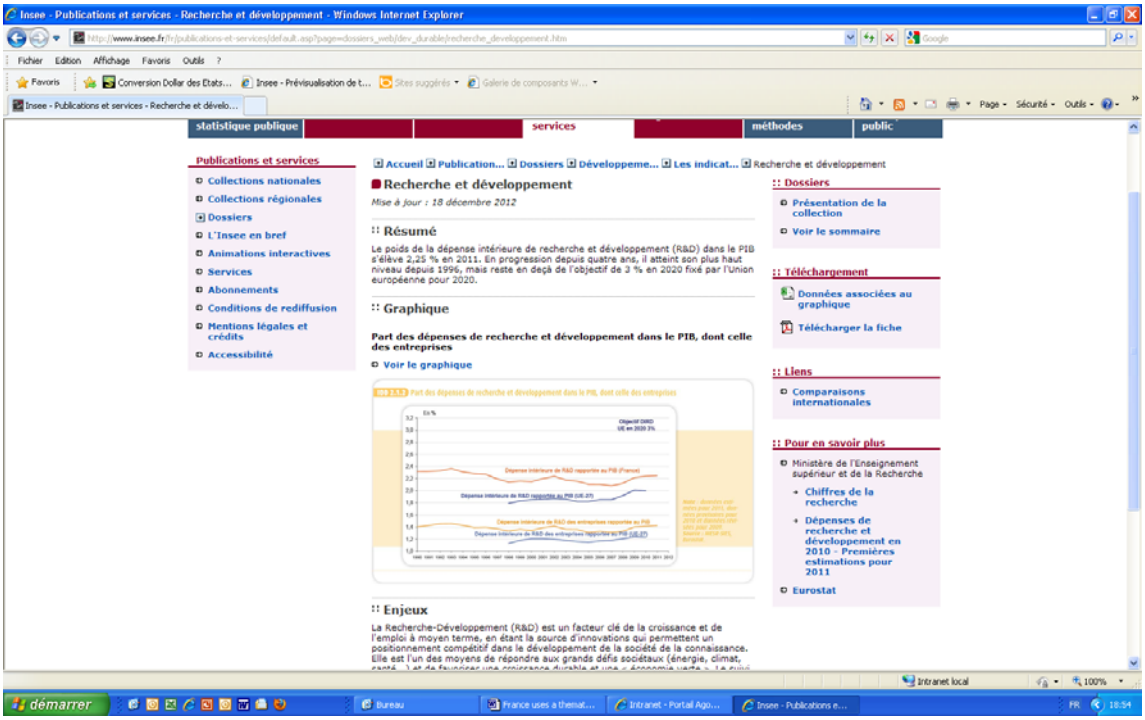

Figure IX. 1. The details page concerning research and development

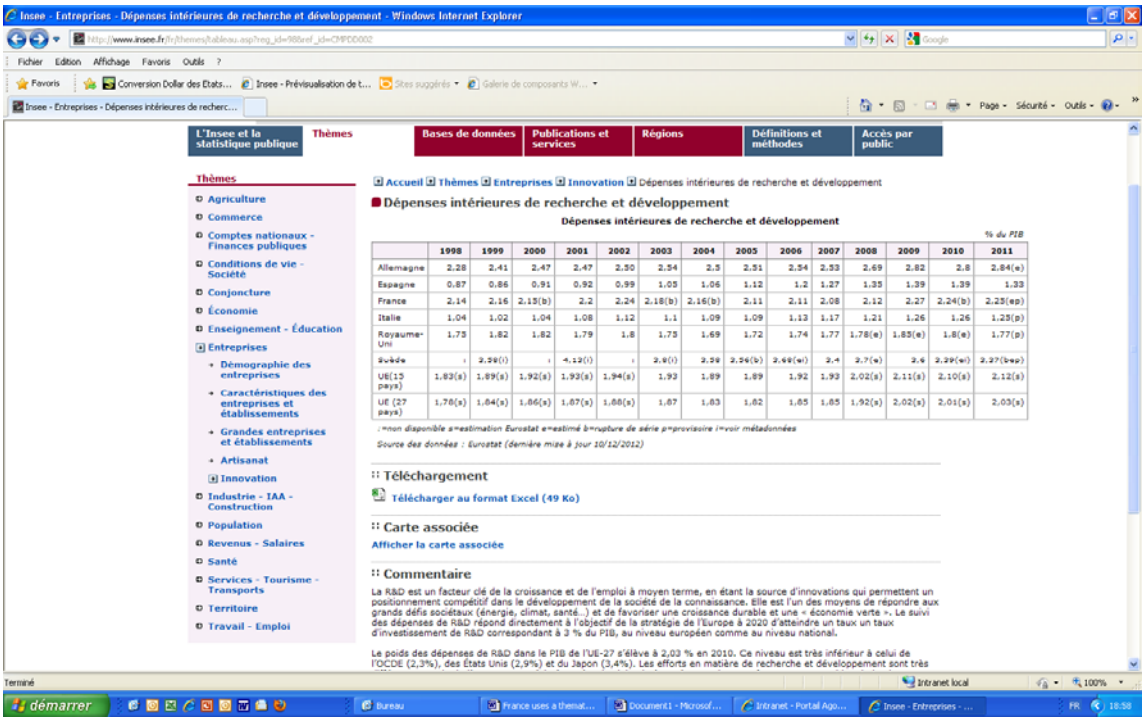

Figure IX.2 The page showing international comparison of research and development

474. Each year, the indicators are updated and a report is transmitted to the French Parliament, with comments on the implementation of the national sustainable development strategy and an annex (the statistical part) with the synthetic cards for each indicator. To disseminate the information more widely, paper-based publications (report for Parliament but also booklets) and on-line dashboards and publications are both used (on websites of Insee and Ministry of Ecology).

The web-based visualisation allows users to access the summary sheet, the data which underlie the graph. For each of the indicators, where possible, European comparisons are given with data and map to compare the position of different European countries (see Figures IX.1 and IX.2). For further details, links with the original producers of the information are also given.

475. More information can be found on the website of Insee or Ministry of Ecology.
http://www.insee.fr/fr/publications-et-services/default.asp?page=dossiers_web/dev_durable/indicateur-developpement-durable.htm
http://www.statistiques.developpement-durable.gouv.fr/indicateurs-indices/li/indicateurs-developpement-durable-nationaux.html

IX.2. The Netherlands: Sustainability Monitor

476. Statistics Netherlands uses a system that is nearly identical to the framework presented in the current publication. The system includes a conceptual (56 indicators) and thematic categorisation (129 indicators) to measure sustainable development (CBS, 2009; 2011; Smits and Hoekstra, 2011).

477. Figure IX.3 presents the visualisation of the conceptual categorisation of SDIs. 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 may have one or more indicators. For each of the indicators data show the trend (2000 to present) and the comparison between 27 countries of the European Union.

478. Figure IX.3 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. Therefore the pie chart on the left is 50% green and 50% yellow. The pie chart on the right shows that the Netherlands scores in the top 9 of EU countries because the whole pie chart is green (the top third of countries is given a green score, etc.).

479. The visualisation works well to make clear the trade-offs between the 'here and now', 'later' and 'elsewhere'. 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 communicate the message that the developments in current well-being are unsustainable because of their repercussion for future generations and other countries.

480. Figure X.4 shows the thematic categorisation. Fourteen themes are distinguished for which a total of 129 indicators have been chosen. The pie charts are constructed in the same way as for the conceptual categorisation.

481. The web-based visualisation allows users to access the data that underlie the pie charts. For example, Figure IX.4 shows the education level of the Netherlands. If a user clicks on the theme 'education and knowledge', Figure X.5 appears. For each of the indicators of this theme, the development and the international rank of the Netherlands is provided.

482. 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 IX.3. Visualisation- The Netherlands (Conceptual categorisation)

Figure IX.4. Visualisation- The Netherlands (Thematic categorisation)

Figure IX.5. Visualisation- The Netherlands (Indicator details)

IX.3. Switzerland: sustainable development indicator system MONET

483. Switzerland uses a conceptual framework based on a frame of reference and a systemic structure to monitor sustainable development. The monitoring system is called MONET and comprises 75 indicators (for details, 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) if the observed trend is in line with the target trend (defined by the frame of reference), negative (red, moving away from sustainability) if the observed trend is opposite to the target trend, and neutral (yellow) when there is no significant change.

484. An extract from the whole MONET system is dedicated to monitoring the Swiss Federal Council's Sustainable Development Strategy (Swiss Federal Council, 2012). 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. The extract from the whole system to monitor the SDS comprises 60 indicators.

485. Switzerland uses a visual aggregation method called Dashboard[59] to synthesise the information delivered by these 60 indicators. All indicators are presented using 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 and allows each key challenge or indicator separately to be consulted. These elements are described below.

[59] www.monet.admin.ch >> Cockpit (german) or >> Tableau de bord (french)

The home page

486. The three primary objectives 'Social Solidarity', 'Economic Efficiency' and 'Environmental Responsibility' are shown on the home page (see Figure IX.6). The 11 key challenges are visible on the right-hand side. Dragging the cursor over the key challenges shows the indicators of the respective key challenge in the corresponding primary objective.

487. 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-hand side of the indicator shows evaluation of the trend.

The single pages

488. Each key challenge can be viewed separately by clicking on it on the right-hand side. Five indicators (or fewer if data are 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 assumption 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 range from -5 (red) through zero to +5 (green). 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 IX.7.).

489. The chart of each indicator can be displayed by clicking on the labels of the indicators (see Figure IX.8). The curve on the chart illustrates the trend. 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

490. The overall evaluation of the indicators measuring the Sustainable Development Strategy (see Figure IX.9) is shown by the 11 red-to-green-scales (also shown separately on the single pages). They 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.

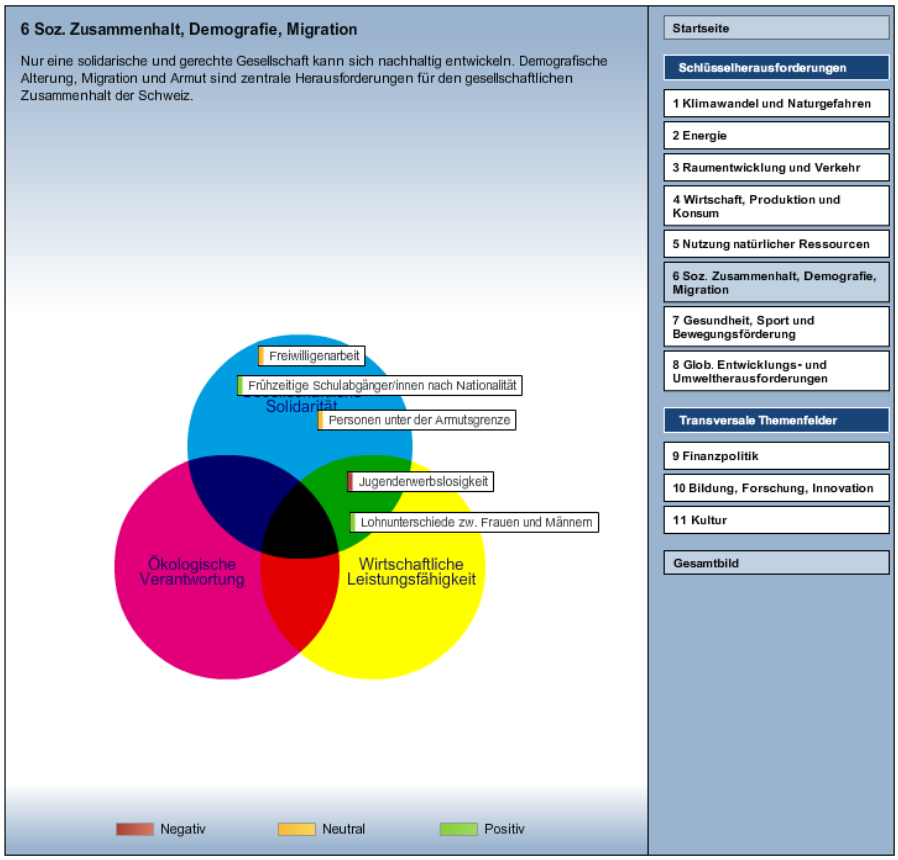

Figure IX.6. The home page and the position of the indicators in the three primary objectives

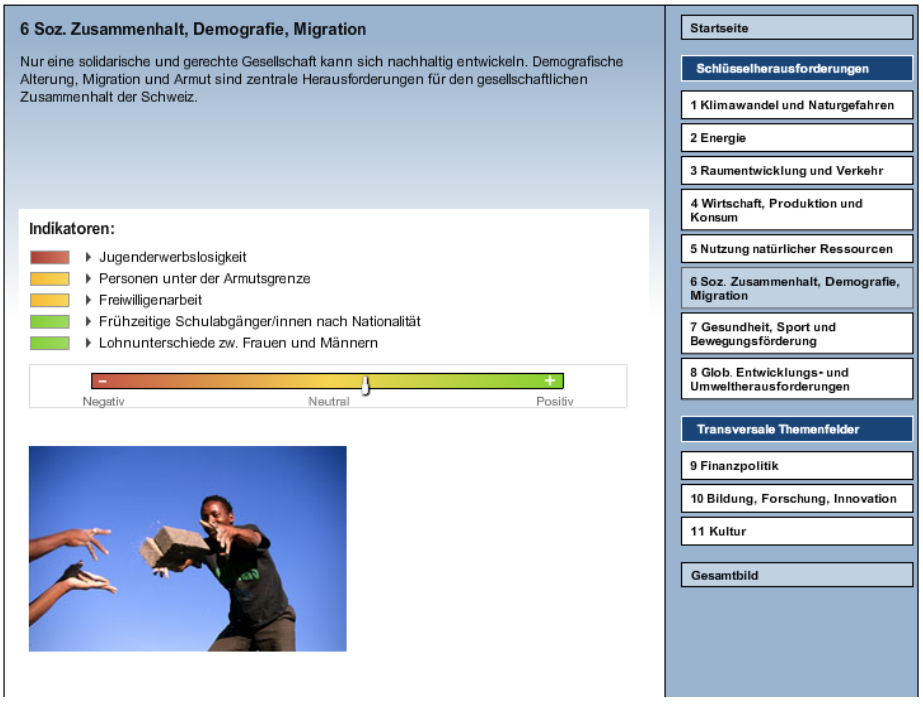

Figure IX.7. The single pages

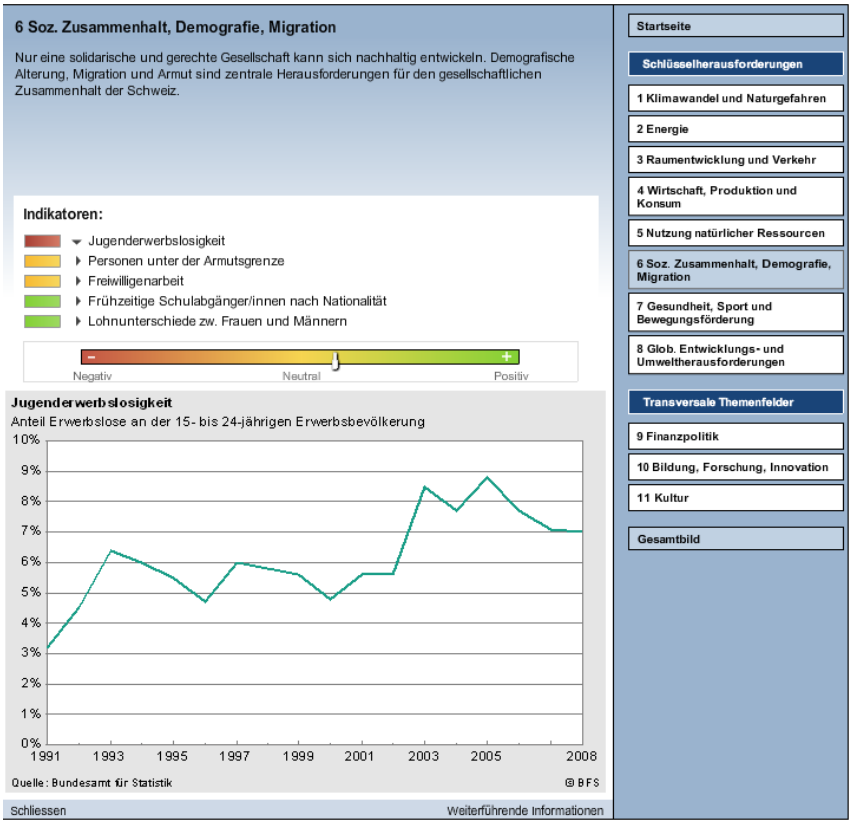

Figure IX.8. The single pages – chart and further information

Figure IX.9.The overview page – showing the trend evaluations: in which direction are we going?

IX.4. OECD: Better Life Initiative

491. The OECD released the 'Your Better Life Index' in May 2011, on the occasion of the 50th anniversary of the OECD. It 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 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').[60]

492. 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 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 IX.10.).

493. 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 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 a few exceptions) are nationally representative of the resident population aged 15 and over in the entire country (including rural areas).

494. 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[61], 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.[62]

[60] 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
[61] See OECD(2008), Boarini *et al*. (2011)
[62] Further information can be found at: http://www.oecdbetterlifeindex.org/

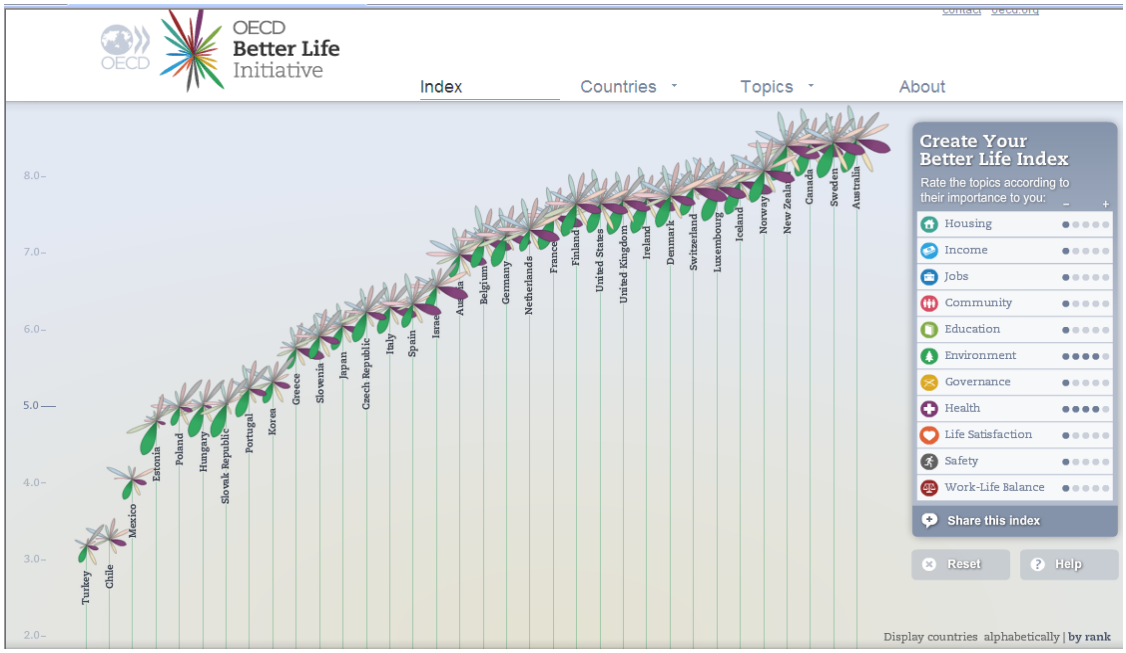

Figure IX.10. The OECD Better Life Index

ANNEX X. MILLENNIUM DEVELOPMENT GOALS

This Annex provides the list of targets and indicators of the Millennium Development Goals (MDG) (available at: http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm).

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[1] 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 CO_2 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[2]
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".

[1] For monitoring country poverty trends, indicators based on national poverty lines should be used, where available.
[2] The actual proportion of people living in slums is measured by a proxy, represented by the urban population living in households with at least one of the four characteristics: (a) lack of access to improved water supply; (b) lack of access to improved sanitation; (c) overcrowding (3 or more persons per room); and (d) dwellings made of non-durable material.