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The SEEA and indicator initiatives: A preliminary note

Paper prepared by UNSD

(for discussion)

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A. Introduction

1. Several initiatives have recently been launched or are being launched in the near future in the broad context of green economy, green growth and sustainable development. Some of the indicator initiatives as sector specific or focus on specific resources.

2. There seems to be a new wave of indicator initiatives partly linked to the need to monitor the recent concepts of green economy and green growth, partly to try to embed the measurement of sustainable development in a conceptual framework, and partly to monitor specific policies for particular natural resources (e.g. water, forest, fish, energy, etc.). All these initiatives aim to answer increasing policy demands now that the environment has become more prominent in the national and international policy agendas.

3. Given the current effort of the statistical community to elevate the SEEA to the level of an internationally agreed statistical conceptual framework for environmental-economic accounting and supporting statistics, the SEEA is well placed to provide a statistical framework for the derivation of these indicators.

4. This note provides a preliminary analysis of selected indicator initiatives and their link with the SEEA by showing which indicators can be derived from the SEEA. It also discusses the advantages of deriving a coherent set of indicators from an accounting framework not only from a statistical perspective, but also from an analytical perspective to understand the underlying causes of change in the policy indicators. Moreover, the note elaborates on the integration of the statistical production process for economic and environment statistics by building on the existing knowledge and statistical capacity in national accounting. The note concludes that a stepwise integration of the statistics in the accounting framework is encouraged to ensure coherent set of environmental and economic statistics and indicators based on a cost effective statistical production process, which results in minimizing response burden.

5. Some questions for discussion by the UNCEEA are presented in para.30.

B. Analysis of selected indicator initiatives and their link to the SEEA

6. A number of indicator initiatives have been launched or will be launched at the international level or are under discussion. A selection of these indicator initiatives are:

Green growth: OECD has recently published *Towards Green Growth – Monitoring Progress – OECD Indicators.* The report presents a set of green

growth indicators and makes explicit reference to the SEEA as the underlying framework for many of the green growth indicators that link the economy and the environment.

Green economy: UNEP is in the process of developing a list of indicators to monitor progress towards the green economy. It is expected that the list of indicators will be largely aligned to the list proposed by OECD. UNEP intends to ground its indicators in the SEEA framework.

Measuring sustainable development: The UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development is in the process of preparing a report developing a conceptual approach to identifying indicators to present the long-term, i.e. across generations, dimension of sustainable development.

EU initiatives: Several initiatives have been launched in the context of the European Union, some of those initiatives are policy driven but have implications on the demands for information. These include initiatives in the context of Beyond GDP and Europe 2020 which are reflected in the work of the Task Force 2 on Measuring Environmental Sustainability. The conclusions of the Task Force 2 are aligned to the recommendations presented in this note (see UNCEEA/6/13 for the draft report of the Task Force).

Revision of the Framework for the Development of Environment Statistics (FDES): Although the report will not provide a list of indicators, it will provide a core set of environment statistics for countries to compile and from which indicators can be derived.

Sustainable Development Indicators (SDI): There are numerous initiatives under the umbrella of SDI, notably the initiatives developed under the auspices of the Commission of Sustainable Development and Eurostat. In the aftermath of Rio +20 it is expected that initiatives to update these indicators are likely to be launched.

Convention of Biodiversity (CBD) Indicators: The CBD is now embarking on identifying/developing indicators for measuring progress in implementing its newly adopted strategic plan. The strategic plan contains 20 targets of which target 2 makes explicit reference to the inclusion of biodiversity and ecosystem services into the national accounts.

Global Bioenergy Partnership (GBEP) - Indicators on biofuels: This indicator initiative was put forward by a group backed by governments and international organizations. It proposes 24 indicators of the impact of bio-energy and has been submitted to the G8 summit in May 2011.

7. In this note, the indicator sets of three major international initiatives are reviewed, namely those presented in the OECD Green Growth report, those proposed in the draft report of the UNECE/Eurostat/OECD Taskforce on Measuring Sustainable Development and those proposed by the Global Bioenergy Partnership. Each initiative is unique in objective and scope, but the common thread for all three is that the SEEA is highly relevant as an underlying methodological and organizing framework.

8. Annex I to this note presents the list of indicators in the three reports and an assessment of their relationship to the SEEA accounts.

OECD Green Growth initiative

9. The report titled "*Toward Green Growth – Monitoring Progress*" was presented to the OECD Meeting of the Council at Ministerial Level, 25-26 May 2011. The purpose of the indicators list in the report is to provide a starting point to be gradually elaborated and revised according to evolution in the concepts, methodologies and data availability. The report contains a detailed explanation of the indicator framework and list of proposed indicators for monitoring green growth in OECD countries. The report defines green growth as follows:

> *"Green growth is about fostering economic growth and development while ensuring that the quality and quantity of natural assets can continue to provide the environmental services on which our well-being relies. It is also about fostering investment, competition and innovation which will underpin sustained growth and give rise to new economic opportunities."*

10. The report includes a section on the measurement agenda, providing general direction towards filling current information gaps and collecting and compiling statistics in an integrated way. This section of the report makes explicit reference to the SEEA as the integrating framework for combining economic and environmental information with consistency and international comparability.

11. The indicators proposed are grouped according to 5 main categories: the socio-economic context; environmental and resource productivity; natural asset base; environmental quality of life; economic opportunities and policy responses.

12. The majority of the indicators listed in this report can be derived directly from the SEEA and rely on the definitions and methodological guidelines of the SEEA. While most of the indicators are directly related to the central framework some need to be derived from the experimental accounts for ecosystem. It should also be noted that there is some variance in use of terminology in the Green Growth indicators compared to the SEEA.

Draft report of the UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development initiative

13. The UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development prepared a report for the meeting of the Bureau of the Conference of European Statisticians (CES) held on 23 February 2011. The paper provides a summary of the current structure and main issues for the development of an indicator set for sustainable development. The Task Force is currently drafting a full report, which is expected to be available in 2012.

14. In its report to the CES Bureau, the Task Force cites a "wide-spread feeling that society needs a better statistical 'compass'". The Task Force adopts the definition of

sustainable development from the 1983 Brundtland Commission: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

15. The Task Force report presents a list of proposed indicators by themes and according to three main conceptual categories: human wellbeing, capital and the international dimension. The SEEA is mentioned in many places in the discussions on the individual indicators and themes as the source for definitions and measurement methodology. The SEEA framework underpins a majority of the indicators, with the exception of the measures under some of the social themes (e.g. education and life satisfaction) which are outside the scope of the SEEA.

16. The report does not include much detail on measurement for many of the indicators; therefore in some cases the relationship to SEEA can only be generally inferred based on the title and purpose of each indicator. In general, most of the proposed indicators related to the environment, e.g. themes such as water, air quality, and climate could be derived, in principle, directly from the accounts. Several indicators, particularly those under the land and ecosystems theme, require measures beyond the scope of SEEA central framework but could be compiled through ecosystem accounts. As in the Green Growth report, there are potentially some issues with inconsistency in terminology used for some indicators.

G20 –Bioenergy initiative

17. The Global Bioenergy Partnership (GBEP) has developed a set of 24 sustainability indicators to be presented to the G20 Summit of Finance Ministers in 2011. Work on the GBEP Sustainability indicators was initiated in 2008 through the creation of a task force led by the United Kingdom and subsequently (since November 2010) by Sweden. The purpose of the indicators is to guide analysis of the bioenergy industry to better inform policy from the perspective of sustainable development. The indicators are categorized according to the three sustainability pillars.

18. The GBEP Sustainability indicators provide an example of the potential for applying SEEA to highly sector-specific measures, in this case: bioenergy. For several of the indicators in this list, derivation from the SEEA may require an application and extension of the accounts, even if the principle concepts are aligned. For example, calculating measures representing the entire life-cycle of bioenergy products in terms of emissions would probably require additional disaggregation of emissions accounts. The GBEP task force has cited several indicators under the environmental pillar that would be a potential application of SEEA ecosystem accounts.

19. The reason for the choice of the three initiatives instead of others is because these seem to be emerging initiatives that are at present under consideration either by the statistical community or more broadly in the policy arena. The first two initiatives have a natural link to the SEEA. There is therefore an opportunity to promote the SEEA as the organizing framework of the information for deriving such indicators. The UNECE/Eurostat/OECD report is still being drafted; therefore there is an opportunity to

promote alignment with the SEEA for the final list of indicators and their definitions and terminology. The third initiative on biofuel indicators was selected to show that indicators addressing specific policy concerns can easily be embedded within the SEEA framework through further disaggregating the economic activities and identifying the relevant products.

20. In the next section we discuss the advantages of organizing the information for indicator development according to an accounting framework.

C. Integrating the SEEA as multi-purpose measurement framework and the indicator initiatives as analytical policy frameworks

21. The SEEA is a multi-purpose statistical measurement framework that brings together basic data from different statistical domains, with a focus on the environmental domain, into a common framework for consistent application of concepts, definitions, classifications, tables and accounts. To a large extent the SEEA is coherent with the System of National Accounts that is applied to the compilation and measurement of economic statistics. Because of the integrated nature of the system, even at its initial stages of implementation, the indicators for the different analytical policy frameworks derived from it are internally coherent. By design, the numerator and the denominator of the indicator are derived within the same internationally agreed conceptual framework. As a result, they are coherent and comparable over time and across countries.

22. The added value of deriving indicators from a common framework is that the interpretation of the message underlying various indicators is facilitated. For example, when looking at groups of indicators, it is not uncommon that seemingly contradictory signals may arise. The SEEA framework can help identify the cause of these contradictory signals tracing back the causes of these signals to activities of production, consumption or accumulation, including, for example, the structure of the economy. Furthermore, the SEEA can help in identifying possible actions and their implications. Indicators are a useful monitoring tool but more is needed to understand the underlying causes of change and to analyse possible impacts of future actions. The accounting framework is suited to answer these demands.

23. Having said that the SEEA has a lot to offer in terms of organising the compilation of key aggregates and indicators and more broadly for analysis, in practice not many countries have introduced the industrial breakdown needed to compile the physical flow accounts for water, energy and selected materials as recommended in the central framework of the SEEA, let alone introduced ecosystem related transactions proposed by the various indicator initiatives. The high policy demand for indicator sets presents an opportunity to encourage countries in organising the compilation of the indicators through the implementation of SEEA, preferably through simplified SEEA core tables and accounts for land and natural resources. A very promising avenue in making early progress in the implementation of the SEEA would be to extend the existing knowledge and statistical capacity in many countries in the compilation of supply and use tables for the benchmark estimates for national accounts.

24. The indicator initiatives and the computations of these indicators using the SEEA tables and accounts should be presented as mutually reinforcing statistical exercises. The renewed policy interest in environment related indicators will require the same basic data, to derive indicators and to populate the SEEA tables and accounts. Moreover, countries should be encouraged to align the statistical production process of environmental statistics with the compilation of economic statistics by demonstrating the complementarity of the SEEA and the SNA as organisational frameworks.

25. Critical to the success of aligning the compilation of the indicator sets and the SEEA is that the indicator sets are based on the concepts and definitions of the SEEA. Already, the policy communities sought engagement of the international statistical community in the formulation of the indicator sets. The OECD report, for example, clearly acknowledges the SEEA as being, in principle, the underlying statistical framework for the indicators. This denotes a major change in mind set as opposed to a few years ago, when statistics and indicators and accounts followed different tracks. This may be due partly to the efforts being made to integrate physical information in the accounting system by "bridging" the terms and definitions used by the specialized statistical areas into the SEEA, partly to the widespread recognition of the importance of linking the environment to the economy, and partly to the increased effort by the statistical community to engage scientific and environmentally-related policy communities. The global consultation on the issues in the issue list and the chapters of the revised SEEA may prove to be an important promotional vehicle in engaging the different communities leading towards their understanding and acceptance of the SEEA central framework and ecosystem accounts. Also the SEEA Part III on extensions and applications should clearly demonstrate the integration of the SEEA as measurement framework and the indicator sets as analytical frameworks.

26. At the same time, it is acknowledged that some of the basic data are developed for different purposes and have a long and established history. This is the case, for example, of energy statistics which have been developed by energy engineers for the compilation of energy balances primarily to answer questions of energy security. The energy balances are mostly based on the technology used rather than economic activities. With the energy accounts becoming increasing prominent for linking energy supply and use to economic activities and economic instruments (e.g. energy taxes and emission permits), for productivity analysis and for fiscal policies, there is considerable experience in "bridging" the energy balances to the energy accounts. Although this is not the ideal approach because energy accounts and balances are based on different principles and populating energy accounts starting from the energy balances requires considerable assumptions, in the short term this is a reasonable solution. In the longer term, countries should develop a set of basic statistics that can answer both the need of accounts and balances as recommended in the International Recommendations for Energy Statistics.

27. The SEEA has been perceived by many countries with a less developed statistical system as the "holy grail" – something that they would aspire to compile but beyond their reach. Like with the implementation of the national accounts (with more than 170

countries now submitting these statistics to the United Nations) this myth has to be dispelled by communicating the progressive implementation path from different stages of statistical development. Foremost the link with the compilation of economic statistics and national accounts should be made, whereby the extension to simplified SEEA tables and accounts is demonstrated as a rearrangement of tables and accounts used for the compilation of national accounts and related statistics.

28. These new indicator initiatives that are very much focused on the environment-economy relationship provide an opportunity and a risk. The risk is that countries may be requested to develop different indicator sets, possibly on an ad-hoc basis, to respond to donors' requests (as has been the case in the past), and thus encouraging ad-hoc data collections that are short lived and not integrated within the statistical data production system.

29. The opportunity, on the other hand, is that countries develop the basic statistics to compile indicators in such a way that will allow them to be integrated, in due course, into the accounting framework. It is important to ensure that these initiatives are implemented in such a way that the steps to integrate these data in the accounting tables and the benefits of integration are clear. These benefits should be described in terms of impoved data quality from the check and balances inherent in the system, minimizing resource burden, cost effectiveness and building on existing knowledge and operational capacity in the compiling national accounts. When data is not available, now-casting is a feasible option especially if the data are integrated in the accounting system so that the accounting relationships can be used for more accurate estimation.

D. Questions to the UNCEEA

30. The Committee may wish to discuss the following questions:

(a) Does the UNCEEA have a role to play in ensuring that the SEEA framework is acknowledged as the integration framework and that the definitions used for indicators are consistent, to the extent possible, with those in the SEEA?
(b) Should the UNCEEA ensure that such type of analysis linking the indicators with the SEEA be undertake in a systematic way as a good practice?
(c) Should these indicator initiatives be described in SEEA Part III on extensions and applications?
(d) Should the development of basic environment statistics to populate the core tables of the central framework be closely linked to the development of basic economic statistics in the implementation strategy of the SEEA?
(e) Should the indicator initiatives be used as a vehicle for the SEEA implementation?

Annex I – Analysis of selected indicator initiatives

This Annex analyses the following three indicator initiatives:

- ***Green Growth*** refers to *Towards Green Growth - Monitoring Progress*, OECD Indicators presented to the Meeting of the Council at Ministerial Level, 25-26 May 2011.
- ***Measuring SD*** refers to indicators listed in the ECE Task Force Report on Measuring Sustainable Development prepared for the meeting of the Bureau of the ECE Conference of European Statisticians, 23 February 2011. Themes unrelated to the environment (e.g. 'Education') are omitted from this analysis.
- ***GBEP Sustainability*** refers to the 24 indicators from the Global Bioenergy Partnership, dated May 20, 2011. The GBEP Sustainability Indicators will be presented to the G20 Summit later this year. The indicators are divided according to the 3 pillars of sustainability (environmental, economic, and social). For this analysis only the indicators under the environmental and economic pillars are reviewed

List	Theme	Indicator	Relation to SEEA	**Remarks**
Green Growth	Economic growth, productivity and competitiveness	Economic growth: GDP growth and structure	SNA	
Green Growth	Economic growth, productivity and competitiveness	Economic growth: Net disposable income	SNA	
Green Growth	Economic growth, productivity and competitiveness	Productivity and trade: Labour productivity	SNA	
Green Growth	Economic growth, productivity and competitiveness	Productivity and trade: multi-factor productivity	SNA/Input-Output	
Green Growth	Economic growth, productivity and competitiveness	Productivity and trade: Trade weighted unit labour costs	SNA	
Green Growth	Economic growth, productivity and competitiveness	Productivity and trade: Relative importance of trade: (exports + imports)/GDP	SNA	
Green Growth	Economic growth, productivity and competitiveness	Productivity and trade: Inflation and commodity prices	N/A	
Green Growth	Labour markets, education and income	Labour markets: Labour force participation & unemployment rates	N/A	
Green Growth	Labour markets, education and income	Socio-demographic patterns: Population growth, structure & density	N/A	
Green Growth	Labour markets, education and income	Life expectancy: years of healthy life at birth	N/A	
Green Growth	Labour markets, education and income	Income inequality: GINI coefficients	SNA	
Green Growth	Labour markets, education and income	Educational attainment: Level of and access to education	N/A	
Green Growth	Carbon & energy productivity	Production-based CO2 productivity: GDP per unit of energy-related CO2 emitted	Emission accts	
Green Growth	Carbon & energy productivity	Demand-based CO2 productivity: Real income per unit of energy-related CO2 emitted	Emission accts	
Green Growth	Carbon & energy productivity	Energy productivity (GDP per unit of TPES)	Energy accts/balances	*currently derived mostly from balances*
Green Growth	Carbon & energy productivity	Energy intensity by sector (manufacturing, transport, households, services)	Energy accts/balances	*currently derived mostly from balances*

List	Theme	Indicator	Relation to SEEA	**Remarks**
Green Growth	Carbon & energy productivity	Share of renewable energy in TPES, in electricity production	Energy accts/balances	*currently derived mostly from balances*
Green Growth	Resource productivity	Material productivity (non-energy): Demand based material productivity related to real disposable income Domestic material productivity (GDP/DMC), biotic and abiotic materials	MFA	
Green Growth	Resource productivity	Waste generation intensities and recovery ratios; By sector, per unit of GDP or VA, per capita	Physical flow accts/waste accts	
Green Growth	Resource productivity	Nutrient flows and balances (N,P): Nutrient balances in agriculture (N,P) per agricultural land area and change in agricultural output	Physical flow accts	
Green Growth	Resource productivity	Water productivity: VA per unit of water consumed, by sector (for agriculture, irrigation water per hectare irrigated)	Water physical & monetary accts	*Terminology: 'water consumed'*
Green Growth	Multi-factor productivity	Multi-factor productivity reflecting environmental services; comprehensive measure; original units in monetary terms	?	
Green Growth	Renewable stocks	Fresh water resources: Available renewable resources (groundwater, surface water, national, territorial) and related abstraction rates	Water asset & flow accts	*Terminology: 'available'; Abstraction includes hydro power production?*
Green Growth	Renewable stocks	Forest resources: Area and volume of forests; stock changes over time	Timber asset accts, Land accts	*Terminology: volume of 'timber', not volume of 'forests'?*
Green Growth	Renewable stocks	Fish resources: Proportion of fish stocks within safe biological limits (global)	Fish asset accts.	
Green Growth	Non-renewable stocks	Mineral resources: Available (global) stocks of reserves for selected materials (tbd): metallic minerals, industrial minerals, fossil fuels, critical raw materials; and related extraction rates	Asset & Physical flow accts	*Terminology: 'available', proven & probable? Weighted or not?*

List	Theme	Indicator	Relation to SEEA	**Remarks**
Green Growth	Biodiversity and ecosystems	Land resources: Land cover types, conversions and cover changes: State and changes from natural state to artificial and man-made state.	Land cover & land use accts	*Definition of 'natural' and 'artificial/man-made' state? May be conceptually inconsistent with SEEA unless consistent with land use classifications.*
Green Growth	Biodiversity and ecosystems	Land use: state and changes	Land use accts	
Green Growth	Biodiversity and ecosystems	Soil resources; Degree of top soil losses on agricultural land, other land: Agricultural land area affected by water erosion by class of erosion	Ecosystem accts, potentially from asset accts	*Why only water erosion?*
Green Growth	Biodiversity and ecosystems	Wildlife resources (tbd): Trends in farmland or forest bird populations or in breeding bird populations	Asset accts (biological resources)	
Green Growth	Biodiversity and ecosystems	Wildlife resources (tbd): Species threat status: mammals, birds, fish In % species assessed or known	Supplementary indicators for ecosystem accts?	
Green Growth	Biodiversity and ecosystems	Wildlife resources (tbd): Trends in species abundance	Supplementary indicators for ecosystem accts?	
Green Growth	Environmental health and risks	Environmentally induced health problems and related costs (e.g. years of healthy life lost from degraded environmental conditions, DALYs)	Application of ecosystem accts	
Green Growth	Environmental health and risks	Population exposure to air pollution	Application of ecosystem accts	
Green Growth	Environmental health and risks	Population living in areas under natural risks or exposed to industrial risks	Application of ecosystem accts	
Green Growth	Environmental services and amenities	Access to sewage treatment and sanitation: Population connected to sewage treatment (at least secondary, in relation to optimal connection rate)	Supplementary indicator in IRWS & SEEAW	
Green Growth	Environmental services and amenities	Population with sustainable access to safe drinking water	Supplementary indicator in IRWS & SEEAW	

List	Theme	Indicator	Relation to SEEA	**Remarks**
Green Growth	Technology and innovation	R&D expenditure of importance to GG Renewable energy (in % of energy related R&D) Environmental technologies (in % of total R&D) All purpose business R&D (in % of total R&D)	EPEA Accts	
Green Growth	Technology and innovation	Patents of importance to GG in % of country under the Patent Cooperation Treaty (PCT) - environmentally related and all-purpose patents - structure of environmentally related patents	Possible supplementary of EPEA	
Green Growth	Technology and innovation	Environment-related innovation in all sectors	N/A	
Green Growth	Environment goods and services	Production of environmental goods and services (EGS): Gross vale added in the EGS sector (in % of GDP)	EGSS	
Green Growth	Environment goods and services	Employment in the EGS sector (in % of total employment)	Application of EGSS classification	
Green Growth	International financial flows	International financial flows of importance to GG (in % of total flows; in % of GNI)	?, potentially EPEA	
Green Growth	International financial flows	Official Development Assistance; Carbon market financing; FDI (tbd)	EPEA Accts	
Green Growth	Prices and transfers	Environmentally related taxes: Level (in % of total tax revenues, in relation to labour related taxes)	Monetary accts/env. taxes and subsidies	
Green Growth	Prices and transfers	Structure of environmentally related taxes (by type of tax base)	Monetary accts/env. taxes and subsidies	
Green Growth	Prices and transfers	Energy taxes and end-use prices (share of taxes in end-use prices)	End-use prices from hybrid flow accts	
Green Growth	Prices and transfers	Water pricing and cost recovery ratios (tbd)	Water monetary/hybrid accts	
Green Growth	Prices and transfers	Environmentally related subsidies (tbd)	Monetary accts/env. taxes and subsidies	

List	Theme	Indicator	Relation to SEEA	**Remarks**
Green Growth	Prices & and transfers	Environmental expenditure: level and structure (pollution abatement and control, biodiversity, natural resource use & management)	EPEA Accts	
Measuring SD	Energy reserves	Fossil fuel reserves (TJ per person)	Energy Asset accts	
Measuring SD	Energy reserves	Extraction (TJ per person)	Energy Asset/Physical flow accts	
Measuring SD	Energy reserves	Energy intensity (TJ per unit GDP)	Phsyical flow accts/energy balances	
Measuring SD	Energy reserves	Renewable energy (%)	Energy Asset/Physical flow accts	
Measuring SD	Energy reserves	Import of energy resources (tonnes)	Energy Asset/Physical flow accts	
Measuring SD	Energy reserves	Energy dependence	Energy Asset/Physical flow accts	
Measuring SD	Non-energy reserves	Resource reserves	Asset accts	
Measuring SD	Non-energy reserves	Extraction	Asset/Physical flow accts	
Measuring SD	Non-energy reserves	Domestic Material Consumption	Physical flow accounts	
Measuring SD	Non-energy reserves	Municipal solid waste (kg per person)	Physical flow accounts	
Measuring SD	Non-energy reserves	Import of non-energy resources (tonnes)	Physical flow accounts	
Measuring SD	Land & ecosystems	Land assets	?, Land cover accts?	
Measuring SD	Land & ecosystems	Biodiveristy indicator	?, Ecosystem accts?	
Measuring SD	Land & ecosystems	Red list (no. of species)	N/A	
Measuring SD	Land & ecosystems	Soil quality indicator	?, Ecosystem accts?	
Measuring SD	Land & ecosystems	Emissions to soil	?, Emissions accts?	
Measuring SD	Land & ecosystems	Land footprint	?	
Measuring SD	Water	Water quality indicator	?, Ecosystem accts?	
Measuring SD	Water	Emissions to water	Water asset accts	
Measuring SD	Water	Fresh water resources	Water asset accts	
Measuring SD	Water	Surface and groundwater extraction (M3)	Water physical flow accts	
Measuring SD	Water	Water footprint	Input-Output	

List	Theme	Indicator	Relation to SEEA	**Remarks**
Measuring SD	Air quality	Urban exposure to particulate matter (concentration)	Application of ecosystem accts	
Measuring SD	Air quality	Emissions of particulate matter (tonnes)	Emission accts	
Measuring SD	Air quality	Urban exposure to ozone (%)	Ecosystem accts?, atmosphere	
Measuring SD	Air quality	Emissions of tropospheric ozone (tonnes)	Emissions accts	
Measuring SD	Air quality	Emission of acidifying emissions (tonnes)	Emissions accts	
Measuring SD	Climate	Global CO2 concentration (ppm)	Ecosystem accts, atmosphere	
Measuring SD	Climate	GHG-Emissions (CO2 equivalents)	Emissions accts	
Measuring SD	Climate	GHG-Emissions intensity (CO2 equiv/GDP)	Hybrid flow accts	
Measuring SD	Climate	Carbon footprint	Input-Output	
Measuring SD	Climate	Production based-emission	Emission accts	
Measuring SD		Climate trade balance	Input-Output	
Measuring SD	Climate	State of the ozone layer	Ecosystem accts?, atmosphere	
Measuring SD	Climate	CFC emissions (tonnes)	Emissions accts	
Measuring SD	Wellbeing, Consumption & Income	Household consumption (Euro)	SNA	
Measuring SD	Wellbeing, Consumption & Income	Net national income (Euro)	SNA	
Measuring SD	Wellbeing, Consumption & Income	GDP (Euro)	SNA	
Measuring SD	Wellbeing, Consumption & Income	Labor productivity (growth rate)	SNA	
Measuring SD	Wellbeing, Consumption & Income	Multifactor productivity (growth rate)	Application of SEEA?	
Measuring SD	Physical Capital	Physical capital stock (Euros)	SNA	
Measuring SD	Physical Capital	Gross capital formation (% of GDP)	SNA	
Measuring SD	Physical Capital	Export of physical capital	SNA	
GBEP Sustainability	Environmental pillar	Lifecycle GHG emissions from bioenergy production and use, as per the methodology chosen nationally or at community level, and reported using the GBEP Common Methodological Framework for GHG Lifecycle Analysis of Bioenergy 'Version One'	Emission accts	

List	Theme	Indicator	Relation to SEEA	**Remarks**
GBEP Sustainability	Environmental pillar	Soil quality: Percentage of land for which soil quality, in particular in terms of soil organic carbon, is maintained or improved out of total land on which bioenergy feedstock is cultivated or harvested.	Ecosystem accts	
GBEP Sustainability	Environmental pillar	Harvest levels of wood resources: Annual harvest of wood resources by volume and as a percentage of net growth or sustained yield, and the percentage of the annual harvest used for bioenergy	Forest/Timber accounts	
GBEP Sustainability	Environmental pillar	Emissions of non-GHG air pollutants, including air toxics: Emissions of non-GHG air pollutants, including air toxics, from bioenergy feedstock production, processing, transport of feedstocks, intermediate products and end products, and use; and in comparison with other energy sources	Emission accts	
GBEP Sustainability	Environmental pillar	Water use and efficiency: Water withdrawn from nationally-determined watershed(s) for the production and processing of bioenergy feedstocks, expressed as the percentage of total actual renewable water resources (TARWR) and as the percentage of total annual water withdrawals (TAWW), disaggregated into renewable and non-renewable water sources;	Ecosystem accts, special application of water physical flow accts	
GBEP Sustainability	Environmental pillar	Water use and efficiency: Volume of water withdrawn from nationally-determined watershed(s) used for the production and processing of bioenergy feedstocks per unit of useful bioenergy output, disaggregated into renewable and non-renewable water sources.	Ecosystem accts, special application of water physical flow accts	

List	Theme	Indicator	Relation to SEEA	**Remarks**
GBEP Sustainability	Environmental pillar	Water quality: Pollutant loadings to waterways and bodies of water attributable to fertilizer and pesticide application for bioenergy feedstock cultivation, and expressed as a percentage of pollutant loadings from total agricultural production in the watershed;	Ecosystem accts, emission accts	
GBEP Sustainability	Environmental pillar	Water quality: Pollutant loadings to waterways and bodies of water attributable to bioenergy processing effluents, and expressed as a percentage of pollutant loadings from total agricultural processing effluents in the watershed.	Ecosystem accts, emission accts	
GBEP Sustainability	Environmental pillar	Biological diversity in the landscape: Area and percentage of nationally recognized areas of high biodiversity value or critical ecosystems converted to bioenergy production;	Application of ecosystem accts?	
GBEP Sustainability	Environmental pillar	Biological diversity in the landscape: Area and percentage of the land used for bioenergy production where nationally recognized invasive species, by risk category, are cultivated;	Application of ecosystem accts?	
GBEP Sustainability	Environmental pillar	Biological diversity in the landscape: Area and percentage of the land used for bioenergy production where nationally recognized conservation methods are used	Application of ecosystem accts?	
GBEP Sustainability	Environmental pillar	Land use and land-use change related to bioenergy feedstock production: Total area of land for bioenergy feedstock production, and as compared to total national surface and agricultural and managed forest land area	Application of land use accts	
GBEP Sustainability	Environmental pillar	Land use and land-use change related to bioenergy feedstock production: Percentages of bioenergy from yield increases, residues, wastes and degraded or contaminated land	Application of land use accts	

List	Theme	Indicator	Relation to SEEA	**Remarks**
GBEP Sustainability	Environmental pillar	Land use and land-use change related to bioenergy feedstock production: Net annual rates of conversion between land-use types caused directly by bioenergy feedstock production, including the following (amongst others): arable land and permanent crops, permanent meadows and pastures, and managed forests; natural forests and grasslands (including savannah, excluding natural permanent meadows and pastures), peatlands, and wetlands	Application of land use accts	
GBEP Sustainability	Economic pillar	Productivity of bioenergy feedstocks by feedstock or by farm/plantation; Processing efficiencies by technology and feedstock; Amount of bioenergy end product by mass, volume or energy content per hectare per year; Production cost per unit of bioenergy.	Application of physical flow accts	
GBEP Sustainability	Economic pillar	Net energy balance: Energy ratio of the bioenergy value chain with comparison with other energy sources, including energy ratios of feedstock production, processing of feedstock into bioenergy, bioenergy use; and/or lifecycle analysis	Energy physical & monetary accts	
GBEP Sustainability	Economic pillar	Gross value added per unit of bioenergy produced and as a percentage of gross domestic product	Energy hybrid flow accts	

List	Theme	Indicator	Relation to SEEA	**Remarks**
GBEP Sustainability	Economic pillar	Change in the consumption of fossil fuels and traditional use of biomass: Substitution of fossil fuels with domestic bioenergy measured by energy content and in annual savings of convertible currency from reduced purchases of fossil fuels; Substitution of traditional use of biomass with modern domestic bioenergy measured by energy content.	N/A - modeling of observed and non-observed energy hybrid flows	
GBEP Sustainability	Economic pillar	Training and re-qualification of the workforce: Percentage of trained workers in the bioenergy sector out of total bioenergy workforce, and percentage of re-qualified workers out of the total number of jobs lost in the bioenergy sector	N/A	
GBEP Sustainability	Economic pillar	Energy diversity: Change in diversity of total primary energy supply due to bioenergy	Application of energy accts or energy balances	
GBEP Sustainability	Economic pillar	Infrastructure and logistics for distribution of bioenergy: Number and capacity of routes for critical distribution systems, along with an assessment of the proportion of the bioenergy associated with each	N/A	
GBEP Sustainability	Economic pillar	Capacity and flexibility of use of bioenergy: Ratio of capacity for using bioenergy compared with actual use for each significant utilization route; Ratio of flexible capacity which can use either bioenergy or other fuel sources to total capacity.	N/A	