United Nations ECE/CES/2013/24

Economic and Social Council

Distr.: General
22 March 2013

Original: English

Economic Commission for Europe

Conference of European Statisticians

Sixty-first plenary session
Geneva, 10-12 June 2013
Item 3 (b) of the provisional agenda
Key challenges in implementing the System of Environmental-Economic Accounting

The Green Growth Initiative and the System of Environmental-Economic Accounting Central Framework

Note by the Organisation for Economic Co-operation and Development

Summary

This paper discusses the role of the System of Environmental-Economic Accounting Central Framework as a measurement tool for related policy issues, such as the Green Growth Strategy of the Organisation for Economic Co-operation and Development.

The notion of 'greening the economy' is receiving more and more attention from policy and decision makers. Many indicators for the measurement of green growth and green economy can be directly obtained from the System of Environmental-Economic Accounting. It provides an integrated statistical framework that relates the environment to the economy. This is why it is particularly suitable for deriving indicators for green growth.

Furthermore, the System of Environmental-Economic Accounting provides useful indicators for monitoring environmental and resource efficiency, the natural asset base, environmental policy instruments and economic opportunities arising from green growth. This paper will focus on how the Green Growth Strategy indicators fit into the Central Framework, and how the implementation of the System of Environmental-Economic Accounting will support the further development of Green Growth indicators.

I. Introduction

1. *Towards green growth: Monitoring progress – OECD Indicators*, the Organisation for Economic Co-operation and Development (OECD) report on indicators for Green Growth, is a key element of the overall OECD Green Growth Strategy presented to Ministers at their May 2011 Council meeting. The report supports the development of policies to promote green growth by laying out a conceptual framework for measuring progress and proposing a preliminary list of indicators selected based on well-defined criteria. The report also includes a measurement agenda identifying future areas of work to address issues with the indicator set as well as other related measurement issues.

2. The list of proposed indicators comprises around 25 indicators – not all of which are measurable today. While a broad range of indicators is necessary to adequately capture the multidimensional nature of green growth, it carries the risk of losing a clear message – both for policy makers and the public at large. Therefore, a process was initiated in 2012 and has since been completed to select a small set of 'headline' indicators to track central elements of the green growth. Six indicators were selected by an expert group that brought together different constituencies (economic experts, environment experts and statisticians). The set of headline indicators, their rationale and choice is described at greater length in the updated 2013 OECD Report on Green Growth Indicators.

3. The strength of the OECD's approach to measuring green growth is the use of a conceptual measurement framework. The measurement framework is a tool to organise thinking about the sources of green growth and appropriate indicators as well as to identify relevant, succinct and measurable statistics. Indicators are divided into four groups, aimed at capturing the four main dimensions of green growth. These are complemented with a group of general indicators describing the socio-economic context (see figure 1).

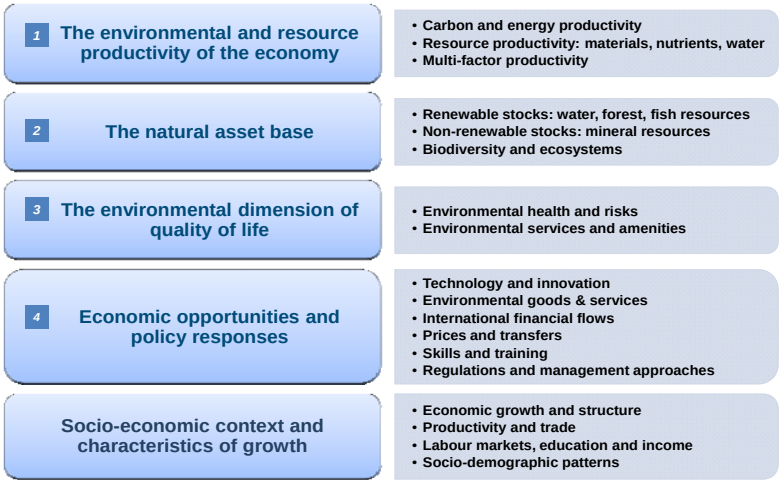
4. The framework begins at the sphere of production. Indicators of **environmental and resource productivity** track to what extent economic activities – both production *and* consumption – are becoming greener. But rising productivity is not enough – an absolute decline in environmental pressures is often needed to insure against any future shocks to growth. To this end, a second group of indicators focuses on monitoring the **natural asset base** and whether it is being kept intact and within sustainable thresholds. A third group of indicators on the **environmental quality of life** captures the direct and indirect interaction between people and the environment. Finally, greening the economy also generates opportunities for growth and employment. A fourth group of indicators sets out to capture both these **economic opportunities** that arise from green growth **and the policy responses** that trigger them.

5. In February 2012, the United National Statistical Commission adopted the System of Environmental-Economic Accounting (SEEA) 2012: Central Framework (SEEA Central Framework) as the initial version of the international standard for environmental-economic accounts. The SEEA Central Framework provides a statistical framework consisting of a comprehensive set of tables and accounts, which guides the compilation of consistent and comparable statistics and indicators for policymaking, analysis and research purposes. It combines macro-economic statistics (national accounts) and environmental statistics, based on agreed definitions, methodology and accounting principles. It is designed to study environmental pressures from economic activities (production, consumption) in a systematic and consistent way.

6. The conceptual underpinning of the OECD Green Growth Strategy and the one of the SEEA Central Framework are very similar in that they try to combine the economic

sphere with environmentally related issues. As such, the SEEA provides an essential framework for research and statistical analysis related to the OECD Green Growth Strategy. In this paper, the relationship between both of them, and the (possible) use of the data according to SEEA, are described in more detail. Before doing so, the indicators from the OECD Strategy are presented in somewhat more detail.

Figure 1
Green growth indicator groups and themes



Source: OECD (2011), *Towards Green Growth: Monitoring Progress - OECD Indicators*.

II. The indicators

7. The measurement framework of the OECD Green Growth Strategy supported the development of a first list of about 25 green growth indicators. These were presented in the 2011 indicators report to Ministers along with data for OECD and emerging economies (the full list of proposed indicators is found in Annex). The OECD plans to update the indicator report regularly with a first update in 2013.

8. The list of indicators should not be considered exhaustive or final. It represents a preliminary selection made on the basis of existing work and experience in the OECD, the International Energy Agency (IEA), other international organisations, and member and partner countries. Gaps exist and some of the selected indicators are not currently measurable. Work continues to refine and elaborate the indicator set as new data become available and concepts evolve. Related work on indicators being undertaken by other international organisations, including the United Nations Environment Programme (UNEP) through its *Green Economy Initiative* and the European Commission through the *Roadmap to a Resource Efficient Europe*, will also inform work. The OECD continues to work with these and other partner organisations towards greater harmonization across indicators to reduce the statistical burden on member countries and increase clarity for users.

9. A set of principles was used to guide the development of the full set of indicators and these are also relevant when selecting headline indicators. For the indicator set as a whole, emphasis was placed on:

(a) Achieving a balanced coverage of the two dimensions of green growth – "green" and "growth" – and of their main elements, with particular attention given to indicators capturing the interface between the two; and

(b) Monitoring the key issues of common relevance to green growth in OECD countries and in partner countries.

10. Individual indicators were then assessed against a more general set of principles related to policy relevance, analytical soundness and measurability that the OECD applies in all of its work on indicators (see table 1). However, indicators did not need to meet all three criteria in order to be retained in the indicator set. Flexibility, especially with regards to measurability, was often needed to ensure balanced coverage of the main elements of green growth and the key issues common to OECD countries. Indicators were scored on a scale according to their relevance for green growth, their analytical soundness, and the measurability of the underlying data. In instances where the desired indicator is not currently measurable, proxy indicators were proposed (e.g. nutrient balances in agriculture currently serves as a proxy for economy-wide nutrient balances).

Table 1
General principles in selecting indicators

Policy relevance	Indicators should have a clear policy relevance, and in particular: • provide a balanced coverage of the issue, with a focus on those that are of common interest to OECD member and partner countries • be easy to interpret and transparent, including allowing users to understand the significance of their values and changes in those values over time • allow for comparisons across countries • lend themselves to being adapted to different international contexts and applied at different levels of detail or aggregation.
Analytical soundness	Indicators should be analytically sound and benefit from a consensus about their validity. They should lend themselves to being linked to economic and environmental modelling, forecasting and information systems.
Measurability	Indicators should be based on data that are available or that can be made available at a reasonable cost; that are adequately documented and of known quality; and that are regularly updated.

Source: OECD (2011), *Towards Green Growth: Monitoring Progress - OECD Indicators.*

III. The relationship between the Organisation for Economic Co-operation and Development Green Growth Initiative and the System of Environmental-Economic Accounting Central Framework

11. The SEEA Central Framework lends itself to the derivation of many indicators. Some indicators are directly embedded in individual SEEA accounts in the form of aggregates (e.g. total for the economy as a whole, balancing items). Other indicators can be calculated as ratios between variables from different SEEA accounts or by relating data from SEEA accounts to data from national accounts. In some cases, the indicators can only be derived by using the analytical tools described in SEEA Applications and Extensions.

12. For the time being, the data underlying indicators have been sourced from other statistical sources (environmental monitoring systems, emission inventories, pollutant release and transfer registers (PRTR), business surveys, national accounts, foreign trade statistics, etc.). These other statistical sources are usually needed to populate SEEA accounts, but can also be used directly to calculate certain indicators. Adapting them to

SEEA definitions and classifications would help to improve the coherence of underlying data sets and thus make them more reliable for analyzing green growth issues.

13. The use of common concepts, definitions, and classifications is central to the usefulness of the SEEA for deriving indicators that monitor the interactions between the economy and the environment. Monetary and physical data can thus easily be combined in a consistent format, for example for calculating intensity and productivity ratios. And macro-level indicators can easily be broken down by economic sector and by industry, to show structural changes over time, to analyse environmental pressures exerted by different industries, and distinguish government responses from those of the business sector or private households.

14. This is particularly important when the indicators are to inform about both the environmental effectiveness and the economic efficiency of policies, or when they are to support structural policy analyses. It is essential when measuring progress towards green growth and sustainable development, and when monitoring the integration of economic and environmental policies. Indicators that benefit most from the SEEA accounting framework include:

(a) Indicators that monitor the environmental and resource efficiency of the economy;

(b) Indicators that monitor environmental assets and their role in the economy;

(c) Indicators that monitor environmentally-related activities and instruments, and their role in the economy.

15. Indicators that monitor social aspects and the environmental dimension of quality of life are not (yet) well covered by international standards related to environmental-economic accounting. Although several social variables are included in the SEEA Water and SEEA Energy, and can be used to calculate indicators (e.g., data on access to water, and energy fees and subsidies for households and industries), these indicators will not be dwelt upon in this paper. The following will mainly provide an overview of the different indicators that can be sourced from the SEEA Central Framework.

IV. Indicators that monitor the environmental and resource efficiency of the economy

16. Improving the environmental and resource efficiency of production and consumption is an essential ingredient of environmental and green growth policies. Developments in the environmental and resource efficiency may be monitored at a broad level through a variety of indicators, including productivity and intensity ratios and decoupling trends. These indicators combine physical and monetary data, or show them in parallel. They relate the use of environmental services in production and consumption to the output generated, and track decoupling between trends of production and consumption and trends in the use of the associated environmental services. Depending on the type of environmental service considered, one can distinguish between (i) environmental efficiency indicators and (ii) (natural) resource efficiency indicators.

17. Environmental efficiency indicators characterise the environmental and economic efficiency with which pollutants and other residuals generated in production and consumption are mitigated, controlled and prevented. They are usually expressed as intensity or productivity ratios. They relate environmental variables such as emissions of pollutants and other residuals to economic variables such as output, income and value added; or alternatively to population. Environmental efficiency indicators can be disaggregated by sector and by industry, as well as by emission source.

18. Resource efficiency indicators characterise the environmental and economic efficiency with which natural resources, including water, energy and other materials are used in production and consumption. They are usually expressed as intensity or productivity ratios. They relate environmental variables such as the extraction, supply or consumption of natural resources and materials to economic variables such as output, income and value added.

19. All environmental and resource efficiency indicators can be presented at the aggregate national level and broken down by economic sector and by industry. Many of them can be presented in the form of issue profiles. When associated with more detailed analytical tools such as 'structural decomposition analysis', these indicators can further be decomposed to reflect the extent to which underlying drivers (e.g. technological factors) and structural changes, contributed to reducing or adding to environmental pressures over the considered period. This is important information to analyse trade-offs between different policies and strategies. Some of these indicators can also be calculated taking into account the upstream requirements for environmental services and thus reflect the use of environmental services induced by final demand.

20. As stated before, efficiency indicators are usually expressed as intensity or productivity ratios. Intensity indicators are calculated as the ratio of the environmental service used or environmental pressure created to the economic value added (or output), while productivity indicators are calculated as the inverse ratio. When monitoring trends over a given period, they can also be expressed as decoupling ratios or as decoupling factors. The economic aggregates used in the calculation of the indicators should be measured in volume terms for time series purposes. For indicators that show a country's production, and the interaction of this production with the environment, output or Gross Domestic Product (GDP) are useful vehicles. For indicators that show a country's final demand for environmental services, household consumption or real net income measures are preferred.

21. The OECD Green Growth measurement framework contains several indicators concerning the environmental and resource efficiency (or productivity) of the economy; see Annex 1. The efficiency indicators relate to CO2-emissions, and the use of energy, non-energy material and water. All relevant environmental data can be derived from tables defined in the SEEA Central Framework:

(a) Air emissions account (Table 3.6.1);

(b) Physical supply and use table for energy (Table 3.4.1);

(c) Economy wide material flow accounts (see SEEA Central Framework, section 3.6.6);

(d) Physical supply and use table for water (Table 3.5.1).

22. In respect of the above indicators, some of them are production-based and others are demand-based. Most environmental and resource efficiency indicators are **production-based**; they account for the environmental services directly used by domestic production. One reason for changes in a country's environmental or resource productivity can be a change in the international structure of production. This is the case for instance when environmental services used in one country are replaced by inputs from abroad. If the production of these inputs has a low environmental efficiency, its displacement abroad will improve the domestic efficiency but not necessarily the global environmental efficiency. Apparently 'positive' national developments may then merely be a reflection of the substitution of domestic environmental pressures for pressures overseas (i.e. through imports).

23. It is thus of interest to calculate indicators that account for **demand-based** environmental services, i.e. those flows of environmental services that are induced by domestic final demand. This approach tracks the environmental services embodied in imports that have been delivered upstream by natural assets and ecosystems to production processes abroad. This indirect upstream use of environmental services is added to the direct use of services for domestic production. Conversely, the environmental services embodied in the exports of domestic products are deducted. The resulting indicators inform about the net direct and indirect use of environmental services in domestic final demand – essentially consumption of households and government, and investment. Prominent examples include demand-based carbon productivity indicators.

24. To adequately estimate demand-based indicators, the use of multi-regional input-output tables is indispensable. The OECD has assumed responsibility for the compilation of worldwide input-output tables, built up from national input-output tables and data on international trade in goods and services. These tables are not only useful for estimating of environmentally related indicators, but also for other types of analysis for which a reflection of the worldwide integration of economic activities is highly relevant, e.g. Trade in Value Added (see www.oecd.org/trade/valueadded).

25. Finally, in addition to the above the list of efficiency indicators also includes a more generic indicator: multifactor productivity reflecting environmental services. This indicator, however, is not yet measurable. Two measurement issues that must be addressed are determining which environmental services are relevant to include, and more importantly, producing a reasonable estimate for the value of all environmental services. Research work has begun in the field and a first set of results will be available in 2013.

V. Indicators that monitor natural assets and their role in the economy

26. Natural assets are a major foundation of economic activity and human welfare. They are part of the natural capital and provide raw materials, energy carriers, water, air, land and soil, and support the provision of environmental and social services that are necessary to develop man-made, human and social capital. The way natural assets are used and managed has consequences for the environment and the economy, and affects the quality of life and well-being of current and future generations.

27. Progress can be monitored by looking at stocks of natural assets, along with flows of environmental services related to those assets, and by using indicators that reflect the extent to which the asset base is being maintained in terms of quantity, quality or value. Such information is also useful for assessing whether adequate supplies of renewable and non-renewable resources are secured to support economic activities and growth. Both physical and monetary indicators are relevant to describe environmental assets. A vast array of useful data on the stocks and changes in stocks of environmental assets can be found in asset accounts that are usually constructed in both physical and monetary terms.

28. It has to be noted that when indicators simply record levels and changes in resource stocks and their value, this says little about whether natural resource use is sustainable or whether there is a risk to future economic growth and well-being from unsustainable use and management practices. It has also to be noted that the stocks of many natural resources are unevenly distributed among countries and within countries. This spatial component needs to be considered when developing and interpreting natural resource indicators.

29. The OECD Green Growth measurement framework contains indicators on renewable resources (freshwater, forest and fish), non-renewable mineral resources, and indicators related to biodiversity and ecosystems (land, soil and wildlife); see Annex 1.

When looking at the depletion of natural resources, a measure of physical change is relevant, and hence there is interest in comparing rates of depletion relative to the levels of the stock of certain natural resources. These comparisons give an insight into the extent to which extraction rates are likely to exceed rates of regeneration of renewable stocks and can be used to assess remaining resource lives for non-renewable stocks. For mineral and energy resources this can further be related to rates of discovery of new resource stocks.

30. Asset accounts in monetary terms can be used to derive indicators on individual assets and indicators on a combination of assets. The existence of a common metric makes it easy to aggregate data from different monetary asset accounts. One can thus calculate indicators that inform about the value of a country's natural assets and that can be compared to the value of produced assets or financial assets in the economy.

31. One example of such an indicator is an aggregate index of natural resource use. Such an index should be based on social valuations of natural assets, reflecting scarcities and the positive and negative effects that the use of these resources has on society's present and future welfare. In practice social prices are not available for many natural assets. A more simple technique would consist in valuing resource stocks from a producer perspective, using the discounted expected flow of economic benefits to producers as the valuation criterion. The scope of such an index would be in line with the scope of natural assets in the SEEA Central Framework, comprising soil, timber, water, aquatic resources, energy and non-energy mineral resources. When used in an international context, such an index could be adapted to a country's special circumstances and resource endowments by using country-specific weights. It could be expressed so that a number equal or greater than 1 would indicate that the natural asset base is being maintained or growing, while a number less than 1 would indicate that it is being depleted. Net change is defined as the difference between additions and reductions to stocks of natural resources.

32. Most of the data required for computing the indicators in the field of environmental assets can be sourced from the physical and monetary asset accounts in chapter 5 of the SEEA Central Framework:

(a) Section 5.5: Mineral and energy resources;

(b) Section 5.6: Land;

(c) Section 5.7: Soil;

(d) Section 5.8: Timber;

(e) Section 5.9: Aquatic resources;

(f) Section 5.10: Other biological resources;

(g) Section 5.11: Water.

33. It should be noted that, for the time being, several measurement issues are related to accounting for the above mentioned natural assets as defined in the SEEA Central Framework. It is expected, however, that in the future data from countries in the context of implementing the SEEA asset accounts can become the source for most elements. In respect of natural assets more generally, neither the set of OECD Green Growth Indicators nor the SEEA Central Framework deal with (services derived from) ecosystems, mainly because of the experimental nature of the accounting for the volume and value of these assets. A separate volume of SEEA on "Experimental Ecosystem Accounting" provides further guidance on possible ways forward. A research agenda to better account for ecosystems is also being agreed upon.

VI. Indicators that monitor environmentally-related activities and instruments and their role in the economy

34. The OECD Green Growth framework also covers indicators that monitor environmentally-related activities and instruments and their role in the economy. Some of these indicators are covered by tables from the SEEA Central Framework, others not (explicitly). The latter category concerns indicators in the field of technology and innovation: research and development (R&D)-expenditure and patents of importance to Green Growth, and environment-related innovation in all sectors. Also international financial flows of importance to Green Growth are not specifically covered by SEEA, whereas only part of indicators related to prices and transfers are dealt with. This section mainly addresses the indicators that are well represented in the SEEA Central Framework, also in the form of having (a) specific table(s) on the topic under consideration.

35. The first of those indicators concerns environmentally-related production. The economic opportunities that arise from environmental considerations can be examined by looking at the role of 'green industries', trade in 'green products' and creation of 'green jobs'. Experience however shows that these concepts are often difficult to pin down statistically. A useful starting point is given by indicators on the Environmental Goods and Services Sector (EGSS). The production of environmental goods and services (EGS) initially aimed at the most visible environmental issues through end-of-pipe solutions and has gradually shifted towards process innovation and integrated clean technologies to prevent pollution, increase resource efficiency and minimise resource use. The most common indicators, which are also part of the list of indicators for the Green Growth Strategy, inform about the importance of environmentally-related activities in the economy and characterise the activities by showing their contribution to value added and employment to the economy as a whole.

36. It has to be noted that the production of environmental goods and services and employment in the EGSS reflect an important, albeit partial, aspect of the green transformation of the economy. Actions in 'traditional' industries (e.g. increased energy efficiency in steel production) can also move an economy towards a low carbon, resource efficient growth path. These changes, while often driven by cost or competitiveness considerations rather than environmental concerns, can have a significant impact. Employment in the EGSS should thus not be misunderstood as being "green" jobs. So far there is no internationally agreed upon definition of "green" jobs. "Green" jobs can be found in any sector or industry throughout the economy, independently of whether particular products serve environmental purposes. The advantage of using indicators based on EGGS statistics, as described in section 4.3.3 of the SEEA Central Framework, is that there is an international consensus about the definitions and classifications to be used.

37. Other indicators, still under discussion in the framework of the OECD Green Growth Strategy, concern environmentally-related expenditures. Efforts to reduce environmental pressures imply public and private expenditure: i) to finance environmental protection activities, ii) to finance natural resource management and preservation, and iii) to provide financial and technical support for environmental protection activities in other countries. Monitoring the levels of these expenditure and their trends over time gives a general indication of how much a country or an industry spends on preventing, controlling and reducing pressures from pollution and resource use, and on managing natural resources and materials in an efficient way. The most common indicators show trends in expenditure on pollution prevention and abatement and biodiversity, the contribution that environmental protection activities make to the economy, the shift to pollution preventing technologies, and how expenditures on environmental protection compare to other types of expenditure. Such indicators are useful to inform about the financial efforts undertaken by society to

prevent, mitigate or abate pollution. Section 4.3.2 of SEEA Central Framework provides a direct link with this kind of indicators.

38. A final category concerns environmentally-related transfers and policy instruments. Economic instruments play an important role in government policies that aim at establishing a resource efficient economy. They are part of the framework conditions that help stimulate greener production and consumption, and promote the development and use of new technologies and innovations. Prices and financial transfers (including taxes and subsidies) provide important signals to producers and consumers and, along with regulations, are tools to internalise externalities and to influence behaviour of market participants towards more environmentally-friendly patterns. The most common indicators inform about tax revenues, both level and structure (e.g. shift from labour and corporate income taxes towards consumption and environmentally-related taxes). Section 4.4.3 of the SEEA Central Framework addresses this area.

39. Less experience exists in using environmental accounts for calculating indicators on environmentally-related subsidies and other transfers. Indicator examples would include: total amounts spent on support measures and their trends over time; amounts spent by receiving sector or industry; by natural resource (fossil fuels, renewable energy), by purpose. The most relevant indicators would distinguish between environmentally harmful and environmentally motivated subsidies. However their definition does not yet benefit from an international consensus.

VII. Conclusions and way forward

40. It is clear that the compilation of SEEA Core Tables will help to arrive at a consistent set of data for a significant number of indicators according to the OECD Green Growth Strategy. It is also one of the reasons that the OECD would like to pursue the collection of the relevant SEEA-data. A proposal to this effect has been put forward to the Statistics Committee of the OECD and to the OECD Working Party on Environmental Information. The proposals entails starting the collection of SEEA Core Tables for emissions to air and natural resources, later on followed by other SEEA-related tables.

41. Since the publication of the international OECD Green Growth Indicators in 2011, several countries have used the OECD framework to calculate the green growth indicators at the national level, by using existing environmental-economic accounts and other sources in the domain of environmental statistics. The following countries have published the results of their research: Czech Republic, Germany, Korea, Mexico, the Netherlands. Work is underway in Colombia, Costa Rica, Ecuador, Guatemala, Paraguay, Peru (supported by The United Nations Industrial Development Organization (UNIDO) and the Development Bank of Latin America (CAF)), and in Kyrgyzstan. Other countries are very much welcomed to join this initiative, in order to improve the information base for green growth indicators and gain feedback on the indicators' relevance.

Annex 1.

Preliminary list of Green growth indicators

1. The proposed list of indicators presented below includes:

(a) M: **Main indicators** (numbered and in bold), and their components or supplements (numbered);

(b) P: **Proxy indicators** (bulleted) when the main indicators are currently not measurable.

2. The proposed indicators are to be accompanied with contextual information or additional indicators to accompany the message conveyed. Each indicator is accompanied with a first evaluation of its relevance for green growth (R), its analytical soundness (S), and the measurability of the underlying data (M). The classifications used for evaluating the indicators are as follows:

Criteria	Classification
Relevance (R)	1= high 2= medium 3= be further reviewed
Analytical soundness (S)	1= good 2= average 3= to be further reviewed
Measurability (M)	S = short term basic data currently available for a majority of OECD countries; M = medium term basic data partially available, but calling for further efforts to improve their quality (consistency, comparability, timeliness) and their geographical coverage (number of countries covered) L = long term basic data not available for a majority OECD of countries, calling for a sustained data collection and conceptual efforts.

The socio-economic context and characteristics of growth		
Economic growth, productivity and competitiveness	**Economic growth and structure** GDP growth and structure; Net disposable income	M
	Productivity and trade Labour productivity; multi-factor productivity Trade weighted unit labour costs Relative importance of trade: (exports + imports)/GDP	M
	Inflation and commodity prices	
Labour markets, education and income	**Labour markets** Labour force participation & unemployment rates	M
	Socio-demographic patterns Population growth, structure & density Life expectancy: years of healthy life at birth Income inequality: GINI coefficient Educational attainment: Level of and access to education	M

Group/theme	Proposed indicators	Type	R	S	M
Environmental and resource productivity					
Carbon & energy productivity	**1. CO_2 productivity**				
	1.1. Production-based CO_2 productivity GDP per unit of energy-related CO_2 emitted	M	1	1	S
	1.2. Demand-based CO_2 productivity Real income per unit of energy-related CO_2 emitted	M	1	2	S/M
	2. Energy productivity				
	2.1. Energy productivity (GDP per unit of TPES)	M	2	1	S
	2.2. Energy intensity by sector (manufacturing, transport, households, services)	M	2	1	S/M
	2.3. Share of renewable energy in TPES, in electricity production	M	1	1	S
Resource productivity	**3. Material productivity (non-energy)**				
	3.1. Demand based material productivity (comprehensive measure; original units in physical terms) related to real disposable income	M	1	3	M/L
	• Domestic material productivity (GDP/DMC) - Biotic materials (food, other biomass) - Abiotic materials (metallic minerals, industrial minerals)	P	1	2	S/M
	3.2. Waste generation intensities and recovery ratios By sector, per unit of GDP or VA, per capita	M	1	1	M/L
	3.3. Nutrient flows and balances (N,P)	M	1	3	L
	• Nutrient balances in agriculture (N, P) per agricultural land area and change in agricultural output	P	2	1	S/M
	4. Water productivity VA per unit of water consumed, by sector (for agriculture: irrigation water per hectare irrigated)	M	1	1	M
Multi-factor productivity	**5. Multi-factor productivity reflecting environmental services** (comprehensive measure; original units in monetary terms)	M	1	2	M/L

Group/theme	Proposed indicators	Type	R	S	M
Natural asset base					
Renewable stocks	**6. Freshwater resources** Available renewable resources (groundwater, surface water, national, territorial) and related abstraction rates	M	1	1	S/M
	7. Forest resources Area and volume of forests; stock changes over time	M	1	1	S/M
	8. Fish resources Proportion of fish stocks within safe biological limits (global)	M	1	1	S
Non-renewable stocks	**9. Mineral resources** Available (global) stocks or reserves of selected minerals (tbd): metallic minerals, industrial minerals, fossil fuels, critical raw materials; and related extraction rates	M	1	2	M/L
Biodiversity and ecosystems	**10. Land resources** Land cover types, conversions and cover changes State and changes from natural state to artificial or man-made state	M	1	1	M/L
	• *Land use: state and changes*	P	1	2	S/M
	11. Soil resources	M	1	2	M/L
	Degree of top soil losses on agricultural land, other land				
	• *Agricultural land area affected by water erosion by class of erosion*	P	1	2	S/M
	12. Wildlife resources (tbd)				
	• *Trends in farmland or forest bird populations or in breeding bird populations*	P	1	2	S/M
	• *Species threat status: mammals, birds, fish, vascular plants* in % species assessed or known	P	2	2	S
	• *Trends in species abundance*	P	1	2	S/M
Environmental quality of life					
Environmental health and risks	**13. Environmentally induced health problems & related costs** (e.g. years of healthy life lost from degraded environmental conditions)	M	1	3	L
	• *Population exposure to air pollution*	P	2	2	S/M
	14. Exposure to natural or industrial risks and related economic losses	M	1	2	L
Environmental services and amenities	**15. Access to sewage treatment and drinking water**	M			
	15.1. Population connected to sewage treatment (at least secondary, in relation to optimal connection rate)		2	2	S/M
	15.2. Population with sustainable access to safe drinking water	–	1	2	S/M

Group/theme	Proposed indicators	Type	R	S	M
Economic opportunities and policy responses					
Technology and innovation	**16. R&D expenditure of importance to GG**	M	1	1	S/M
	- Renewable energy (in % of energy related R&D)		1	1	S
	- Environmental technologies (in % of total R&D, by type)		1	1	S
	- All purpose business R&D (in % of total R&D)		1	1	S
	17. Patents of importance to GG in % of country applications under the Patent Cooperation Treaty	M	1	1	S/M
	- Environmentally related and all-purpose patents		1	1	S/M
	- Structure of environmentally related patents		1	1	S/M
	18. Environment-related innovation in all sectors	M			
Environmental goods and services	**19. Production of environmental goods and services (EGS)**	M	1	2	S/M
	19.1. Gross value added in the EGS sector (in % of GDP)				
	19.2. Employment in the EGS sector (in % of total employment)				
International financial flows	**20. International financial flows of importance to GG** (in % of total flows; in % of GNI)	M	2	1	L
	20.1. Official Development Assistance		2	1	S
	20.2. Carbon market financing		2	1	S
	20.3. Foreign Direct Investment (tbd)		3	3	L
Prices and transfers	**21. Environmentally related taxation**	M	2	2	S/M
	- Level of environmentally related tax revenues (in % of total tax revenues, in relation to labour related taxes)				
	- Structure of environmentally related taxes (by type of tax base)		2	2	S/M
	22. Energy pricing (share of taxes in end-use prices)	M	1	1	S
	23. Water pricing and cost recovery (tbd)	M	1	2	S/M
	To be complemented with indicators on:				
	• *Environmentally related subsidies (tbd)*		1	3	M/L
	• *Environmental expenditure: level and structure (pollution abatement and control, biodiversity, natural resource use & management)*		2	1	L
Regulations and management approaches	*Indicators to be developed*				
Training and skill development	*Indicators to be developed*				