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Monitoring the Shift to Sustainable Consumption and Production Patterns in the context of the SDGs

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Preface

Sustainable Consumption and Production (SCP) is an integral part of the 2030 Agenda for Sustainable Development. Monitoring SCP will require a set of indicators that measures the shift in consumption and production patterns. It will also require institutional capacity to apply these measurements effectively. However, both identifying appropriate SCP indicators and effectively producing and reporting them poses important challenges for governments. This report constitutes an initial proposal to support the monitoring of SCP-related targets of the SDGs, using the SEEA framework which facilitates the connection of data across the environment and the economy that can effectively inform policy-making and other actions. The report also proposes the development of a strategy for capacity building in the context of responding to the need for harmonised and quality assured indicators.

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Executive Summary

Achieving Sustainable Consumption and Production (SCP) patterns has been recognized as an integral part of the 2030 Agenda for Sustainable Development. It is identified as a stand-alone Sustainable Development Goal (SDG 12) and as a central component of many of the 17 goals and 169 targets agreed in the agenda.

Monitoring SCP targets will require a set of agreed upon and comparable indicators, as well as - at the national level - the institutional capacity to produce and apply them. However, many countries face major difficulties in constructing and producing indicators. These include: limited data and resources, limited technical capacity, and fragmented institutional systems. These constraints make it difficult to effectively monitor changes in consumption and production patterns, suggesting the need for substantive efforts in institutional and technical capacity development as well as financial resources.

Furthermore, increased global reporting requirements are not only generating a significant burden on countries, but also increasing the number of reporting systems, this suggests the need to converge towards common statistical standards that can relate and interconnect with one another. In this context, the United Nations Statistical Commission identified the System of Environmental-Economic Accounting (SEEA) as an important statistical framework for the 2030 Agenda for Sustainable Development and the Sustainable Development Goals' indicators. This statistical framework builds on and extends the System of National Accounts (SNA), integrating available data on the economy and the environment, as well as environmentally related economic instruments such as e.g. taxes and subsidies on fossil fuels.

This report constitutes an initial proposal to support the monitoring of SCP-related targets of the SDGs, using the SEEA framework. The report also proposes the development of a strategy for capacity building in the context of responding to the need for harmonised and quality assured indicators. Based on this approach and the analysis undertaken for this paper, we will also discuss more general indicators than those developed by the IAEG-SDGs process. Experience with earlier sustainable development indicators have shown the usefulness of having some underlying analytical possibilities that can help in interpreting the trends of the indicators.

SCP indicators in support of SDG related goals and targets

In this report a set of statistics and accounts that present a link between the environment and the economy, are explored. These provide a deeper understanding of the relation between driving forces, environmental pressures, and policy responses critical in

determining the attainment of the SDGs. These are all key data sources in the discussion on using an integrated statistical framework for monitoring SCP.

The current list of proposed indicators from the Inter-agency Expert Group on SDG Indicators (IAEG-SDGs) will be presented in March, 2016, to the United Nations Statistical Commission. Presently the work of the IAEG has focused on identifying appropriate indicators for the SDG targets. As the process continues, and as data is published, it is likely that there will be new indicators proposed.

Regardless of the specific indicators agreed upon, capacity building efforts will be required at country level to produce these indicators. It is important that these efforts are directed toward the necessary data production and not at creating new and separate indicators. Therefore, the starting point of this report is the current list of IAEG-SDGs indicators. The report explores SEEA compliant data for SCP-related targets in the SDGs 2-3, 6-9 and 11-15.

Table 1 presents the suggested data sets to monitor SCP-related targets including which specific targets the data sets have the potential to respond to. It is a preliminary list which enables tracking changes in production patterns, changes of environmental technologies, consumption patterns related to environmental impacts and natural resource use, and the monitoring of environmental economic instruments. All of them are covered by the SEEA Central Framework. The indicators are exemplified by showing some country cases based on international databases e.g. those of UNEP, the OECD, Eurostat and national data sets. These are presented in Annex 3 of this report.

The information in Table 1 includes, *inter alia*, data sets measuring greenhouse gases emissions which touches upon target 8.4 on decoupling economic growth from environmental degradation; target 9.4 on the adoption of clean and environmentally sound technologies; target 12.2 on achieving sustainable management and efficient use of natural resources; and target 13.1 on strengthening the resilience and adaptive capacity to climate-related hazards and natural disasters.

The advantage of the SEEA is to integrate several areas into one data set as demonstrated in table 1. It is also apparent that only a few data sets analysed in this report are not part of the current IAEG list. The reason for this is that the SEEA covers data that measures drivers, pressures and responses from economic activities, population and the government. With this information it is possible to monitor elements of sustainable production or consumption of interest. This includes the environmental impact of specific economics sectors, as well as their 'environmental' efficiency, by examining the emissions levels as they relate to Gross Domestic Product (GDP).

The current indicators proposed by the IAEG are geared towards measuring the goals and targets by using statistical information, such as government expenditures, GDP, and population statistics. The SEEA contemplates this and other data. Other indicators include institutional data such as monitoring the number of conventions signed, whether or not legal frameworks are in place, or the number of countries with action plans for specific policies. These indicators are not necessarily captured by the statistical community, but are relevant to measuring progress towards some of the established SDG targets.

Table 1: Suggestions of SEEA related datasets to monitor SCP

Data sets	*Detail possible within SEEA*	*Additional detail*	*Targets measured**	*Current target in IAEG-SDGs* **	*Potential Data Source for compilation*
Tracking changes in production patterns - pollution and economy					
GHG-emissions from the economy	Industries, government, households	Divide by value added/GDP, per capita	*8.4, 9.4, 12.2, 13.1*	*9.4, 12.2*	*GHG Inventory, energy statistics*
Emissions to air (PM2,5)	Industries, government, households	Divide by value added/GDP, per capita or focus on cities	*11.2, 11.5, 11.6, 12.2,*	*11.6 to a certain extent*	*PRTR or emissions inventories*
Emissions to water, e.g. N, P, zinc, lead	Emitted by industry. To recipient (wastewater treatment plant or back to the water system (i.e. surface or groundwater, sea, non-point sources)	Divide by value added/GDP, per capita, type of treatment plants	*2.4, 6.3,12.2, 14.1*	*Not included*	*PRTR or emissions inventories*
Use of chemical products	By industry and households	By toxicity classes	*3.9, 12.2, 12.4*	*Not included*	*PRTR*
Tracking changes in production patterns - natural resources and economy					
Amount of waste generated	By generating industry, by receiving industry	Divide by value added or GDP, Type of treatment plants	*3.9, 11.6, 12.2, 12.5,*	*Part of 11.6, 12.4*	*PRTR, waste statistics*
Material use	By material category, by industry, households	Divide by GDP or per capta, linking it to hazardous materials	*8.4, 12.2*	*8.4, 12.2*	*Sectoral data and statistics*
Energy use	By industry, household, government, by energy source (including renewable sources)	Divide by per capita, value added/GDP or GHG	*7.2, 7.3, 8.4, 12.2,*	*7.2 to a certain extent, 7.3, 7b*	*Energy statistics, Energy Balances*
Water use	Industry and households, government, by source	Divide by per capita or value added/GDP	*6.4, 12.2, 13.1*	*6.4*	*Water statistics*
Tracking changes of environmental technologies					
Environmental protection expenditure	By industry, households and government by type of env. area and type of investment	Divide by GDP, value added	*3.9, 6.3, 9.4, 12.2, 13.1, 15.1*	*Not included*	*Sectoral data and statistics, surveys and administrative data*
Value added in environmental goods and services sector	By industry and government, or by env. area	Divide by GDP, value added	*3.9, 6.3, 6.4, 7.2, 7.3, 9.4, 12.2, 12.b, 13.1, 15.2, 15.1*	*Not included*	*Sectoral data and statistics, surveys and administrative data*
Tracking changes in consumption patterns – environmental and natural resource pressures					
Environmental pressure from consumption – materials	Products	Trade partners	*12.2, 8.4*	*12.2*	*Input-output tables, trade statistics, material flow statistics*
Environmental pressure from consumption – GHG emissions	Products	Trade partners	*12.2, 8.4, 13.1*	*Not included*	*Input-output tables, trade statistics, GHG emission accounts*
Tracking changes of environmental economic instruments					
Environmentally related subsidies	By industry, households, by type, GDP or per capita	details of related subsidies to RoW	*6.a, 7.2, 7.3, 7a, 9.4, 12.2, 12.a, 13.1, 14.7, 14.a, 15.a, 15.1*	*6.a, 7a, 15.a*	*Financial statistics*
Environmentally related taxes	By industry, households, by type	Divide by per capita or GDP	*12.2, 13.1*	*Not included*	*Financial statistics*

*Targets measured as evaluated by this project
**As of 18 February 2016

National datasets have also been examined to explore how indicators can be used to monitor for SCP (see details in annex 3). A preliminary assessment suggests that there is data available for many countries, but there is room for improvement in the level of detail and breakdown for certain indicators, and to better align them with the SEEA concepts and classifications. More specifically, this is the case for monitoring changes of environmental technologies, and water emissions data from industries and households. These are important factors and sectors for constructing indicators, for example that monitor targets in goals 3, 6, 7, 12, and 13. It is also observed that in the case of energy statistics where energy balances still prevail and industry breakdowns, following SEEA convention, are still generally missing.

Capacity Building

Many countries are currently in the process of adopting and implementing the SEEA. For some, it is fairly common to use a standards based approach (e.g. using ISIC as classification of economic activities) in the collection and compilation of environmental statistics. This is a prerequisite for moving towards integrated environmental and economic accounts. In other types of environmental data, other sectoral breakdowns are used such as differentiating between the most polluting industries or the most polluted areas, or breakdown by policy relevant sectors that are not directly linked to economic statistics. Therefore, while the SDG indicators are still being developed and reviewed, it is also useful to begin to define the capacity requirements at the country level to monitor and report the progress towards achieving SCP-related SDGs. This early identification of capacity requirements will help strengthen the readiness for measuring the ultimately agreed upon SDG indicators.

One such step is to look at the existing statistical classifications available with the objective in the longer term to develop an integrated statistical system with common classifications and definitions. This is necessary even in countries with good statistical information, so as to inform the necessary integrated and coherent policies for sustainable development in years to come. While an initial investment is needed in such a system, there are important efficiency gains associated with integrated information for policy making and international reporting. Furthermore, the formulation of policy without adequate evidence based information can generate significant costs.

On the basis of the new challenges facing countries in developing statistics to be able to produce appropriate indicators for the SDGs, the present report suggests using existing data and proposes a capacity building strategy for SCP indicators.

Conclusions

This paper summarizes proposals that will be put forward in the discussion on indicators being developed to monitor the progress towards the Sustainable Development Goals.

1) **Identifying available key data sources** that serve to measure progress towards multiple objectives and targets is an important step in facilitating the monitoring of progress towards the SDGs. This report focuses on the link between the environment and the economy in defining those data sources and the indicators they can generate and their multipurpose effect.

The issues discussed in this report are focused on monitoring changes in consumption and production patterns and related initiatives. The key statistical areas include air and water emissions, energy and chemical use, waste generation and material flows, environmental protection, environmental goods and services and finally environmental transfers, such as taxes and subsidies. The area of economic statistics is already available for use where appropriate.

2) **Connecting these statistics**, including using data that is available now or could be made available without the need for additional investment in data gathering. This means a focus on the linkage of the economy to physical flows like air and waste emissions as well as through environmental-economic instruments. This aspect is important when looking at, for example, changes in production patterns through measures of resource use intensity or of productivity.

3) **Strengthening capacity building related to data collection** and application, and to provide an initial assessment of what is required in that respect.

4) **Use as much as possible existing work on statistics and accounts** nationally and internationally. By collecting data from sovereign nations, international agencies can support the work on the SDGs and become facilitators to create synergies and added value. Also it is important to support existing national work, for example the infrequent publishing of input-output tables affects the quality of calculating environmental footprint based indicators which in turn is relevant to monitor changes in consumption patterns, relevant for targets 8.4, 12.2 and 13.1.

In this case large organisations such as the World Bank and the IMF have the potential to highlight the importance of annual dissemination of input-output tables. Monitoring production patterns presents additional challenges, for example, there is a lack of global data collection in chemicals. And the reduction of chemicals use is relevant in several targets such as 3.9, 12.2 and 12.4.

Implementing the Sustainable Development Goals poses major challenges, and constructing and applying appropriate indicators that monitor change is an essential part of ensuring that these goals do make a substantive contribution to human wellbeing. Sustainable Consumption and Production is not only an important goal in itself but a cross cutting issue in most of the 17 goals adopted. Recognizing the capacity building requirements of countries to apply SCP-related indicators is thus essential.

The present report elaborates on these key steps in developing and applying appropriate SCP statistics and indicators for the SDGs.

Contents

1. Introduction

1.1 Sustainable Consumption and Production and Sustainable Development Goals

In 2015 the world agreed to seventeen universally accepted Sustainable Development Goals (SDG). Associated with these goals are 169 targets. Sustainable Consumption and Production (SCP) was identified as a stand-alone goal (SDG 12) and as a central component of many of the goals and targets proposed.

Sustainable consumption and production has been defined as “the use of services and related products which respond to basic needs and bring a better quality of life, while minimising the use of natural resources and toxic materials as well as the emission of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations” (ISSD 1994).

The idea of SCP first emerged in the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, where there was a consensus that environmental degradation was inextricably connected to unsustainable patterns of consumption and production (UN, 1992). This was restated in 2002 at the World Summit for Sustainable Development (The Johannesburg Plan of Implementation, UN WSSD, 2003). At this summit sustainable consumption and production was recognized as “a central objective and essential requirement for sustainable development”.

SCP policies and initiatives have become increasingly important, as nation-states recognize the need to decouple resource use and environmental damage from economic growth. With this in mind, the United Nations Environment Programme (UNEP) is supporting a series of initiatives on SCP, including serving as the Secretariat of the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP). This framework is being implemented by national Governments and wide range of other stakeholders. Currently there are 124 national focal points for the 10YFP across the world, in countries with different levels of development, institutional structure, and political organisation that are implementing SCP type policies and initiatives.

Table 1.1 The Sustainable Development Goals

Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12. Ensure sustainable consumption and production patterns
Goal 13. Take urgent action to combat climate change and its impacts*
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

1.2 Challenges in Monitoring SCP in the context of the SDGs

Monitoring changes in SCP patterns requires a set of indicators that track the impact of policies and initiatives as well as the institutional capacity to implement them effectively. However, proposing appropriate indicators to track changes in consumption and production patterns, in the context of the SDG process, is only one of a number of issues faced by nation-states. Others include the construction and production of the chosen indicators. Many countries may face institutional constraints to be able to respond effectively to these requirements. Constraints identified include:

1. Fragmented national institutional systems with respect to SCP.

2. Decentralized or fragmented systems of information in the environmental sphere.
3. Limited statistical and data resources.
4. Limited technical capacity.

The nature of SCP policies and initiatives, as well as the data requirements, involving a range of Government Agencies, could mean that new collaboration and modes of information sharing have to be developed. This suggests the need for substantive efforts in institutional development and capacity building in order to produce appropriate indicators in the cases they are not already available, as well as facilitate national and international coordination and cooperation. Moving forward, it is important to recognize the institutional constraints in constructing and implementing SCP indicators, as well as complying with the range of information demands that emerge from the SDG process.

The need for monitoring to support national policies and the increasing reporting requirements from various global initiatives on sustainable development issues[1] is, in turn, generating an increasing burden on countries to respond. Therefore, there are potential efficiency gains in the development of indicators for sustainable development by using existing statistics, information, and knowledge, and by moving towards cross-sectoral analysis.

Environmental reporting is often carried out independently across (even within) countries and institutions. For example, in the case of Chile the Millennium Development Goals were reported by the Ministry of Social Development, while environmental indicators are reported by the Ministry of the Environment to the OECD, National Accounts are reported by the Central Bank, and other statistical information is reported by the National Statistical Office. It is anticipated that the situation will be similar in the case of reporting data within the SDGs.

However, the issue is that these reporting requirements are constructed for their own purposes and cannot be used in a cross-sectoral approach. The reason is the prevalence of diverse methodologies, as well as inconsistent definitions and classifications. As a result, many countries have found that different national agencies are adopting different information systems which in turn are increasing the financial and human burden of complying with the requirements from international organisations.

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[1] E.g. the “Green Economy” of the United Nations Environmental Program; “Green Growth” strategy of the Organization for Economic Cooperation and Development; the European Union’s “Beyond the GDP” initiative; and the initiatives set forth in the framework of the Convention on Biological Diversity, among others.

A strategy is necessary to generate these indicators. Among the relevant aspects there is an urgent need to implement consistent statistical frameworks. One such framework which combines environmental with economic issues is the statistical System of Environmental-Economic Accounting (SEEA). Basing SCP indicators on the SEEA standard will ensure that:

a) the statistical underpinnings of the SCP indicators are founded on an integrated accounting approach to evaluate the economic and environmental outcomes of policies and other actions to taken to achieve SDG targets, which ensures methodological soundness, and;

b) the SCP indicators are in line with international standards of best practice to promote quality and comparability on a global scale.

The SEEA Central Framework was adopted as an international statistical standard by the United Nations Statistical Commission at its 43rd session in March 2012 (UN 2012). The SEEA Central Framework represents the first statistical standard for measuring the environment and its relationship with the economy, including the measurement of flows between the environment and the economy, which is currently in use by national governments around the world.

In addition, the SEEA Experimental Ecosystem Accounting has been recognized by the United Nations Statistical Commission[2] as an important framework for measuring ecosystems' condition, ecosystem services and ecosystem degradation with countries being encouraged to experiment with the framework (UNSD, 2015a).

SCP also includes a social component. However, today, indicators monitoring social aspects interlinked with economic and environmental information are not common. To a certain extent, the measurement of some social aspects is already embedded in the SEEA and SNA frameworks – for example employment is an integral part of the national accounts.

The UN-led global assessment on environmental-economic accounting shows that 54 countries have an existing work programme on compiling and disseminating one or more components of the environmental economic accounts system (UNSD 2015).

Table 1.2 Existence of Environmental-Economic Accounting Programmes

[2] The UNSC consists of the general directors from national statistical offices from around the world and is the highest body of the global statistical system. See more at: http://unstats.un.org/unsd/statcom/commission.htm

	Number of Responses (1)	Number countries* without a programme (2)	Existing Programme		Planning a Programme	
			Number of countries with a programme (3)	Percentage countries with a programme (3÷1)	Number of countries* planning a programme (4)	Percentage of countries planning a programme (4÷1)
All Member States	**85**	**31**	**54**	**64%**	**15**	**18%**
By Economic Region:						
Developed	40	9	31	78%	3	8%
Developing	45	22	23	51%	12	27%
By Geographical Region:						
Africa	15	10	5	33%	5	33%
Central, Eastern, Southern and South-Eastern Asia	12	5	7	58%	3	25%
Europe and Northern America	37	8	29	78%	3	8%
Latin America and Caribbean	10	4	6	60%	2	20%
Oceania	3	0	3	100%	0	0%
Western Asia	8	4	4	50%	2	25%

**Where countries refers to those which responded to the questionnaire*

UNSD 2015

The global assessment on Environmental-Economic Accounts also showed that a significant number of countries globally are relying on one or more institutions for the compilation itself. This can be seen as an opportunity for increasing the inter-institutional cooperation process (UNSD, 2015).

While the SDG indicators are still being developed and reviewed, it is necessary to start identifying the capacity requirements and needs at the country level to monitor and report the progress towards achieving SCP-related SDGs. This early identification of capacity requirements will help strengthen the readiness for measuring the ultimately agreed upon SDG indicators.

1.3. Objective

Recognizing the issues outlined above, the overall objective of this paper is to demonstrate the use of indicators for SCP that are aligned with the SEEA concepts, definitions and classifications. The paper analyses possible data sources for these indicators, as well as compliance of these sources with the SEEA concept definitions and classifications. The data sources range from international to national organisations and institutes. The paper also suggests a strategy for capacity building to meet the work ahead on finalizing and applying SCP related indicators for the SDGs.

To fulfil this objective the paper:

1. Explores a set of indicators based on statistics and accounts that present a link between the environment and the economy. The focus is SDG Goal 12 on “ensuring sustainable consumption and production patterns”, and related targets in

other SDGs. Other goals associated with SCP are 2-3, 6-9 and 11-15. Social issues are not dealt with in this paper to any significant extent.
2. Examines the institutional issues associated with developing and constructing SEEA compliant indicators as they relate specifically to the shift to SCP patterns.
3. Proposes a capacity building strategy.

The starting point for the analysis on the indicators is the UNEP discussion paper of March 2015: *Sustainable Consumption and Production Indicators for the Future SDGs.* The analysis in the present paper adjusts the initial list of 24 SCP-related indicators set out in that paper as well as making proposals for additional or alternative indicators. This is based on a deeper analysis of the statistical application of the proposed indicators, the data availability for and utility of the indicators and considerations of practicality of implementation at differing levels of statistical development. The present paper also adds the consideration of securing SEEA compliance for the proposed indicators.

2. The Statistical System

2.1 Role of Statistical Systems

Compiling statistics enables the understanding and interpretation of current and past activities, situations, and changes in behaviour of different agents, providing a guide to policy. A statistical system is the institutional structure that organizes the way statistical information is captured, administered, developed, and published. It is based on measurements from surveys, administrative sources, models or combining already collected data into new information.

National statistical systems ensure the soundness of the statistical collection and compilation processes. The organization of national systems varies considerably across the world. There are differences in resources, technical expertise, and quality, but the most substantive difference relates to the administrative responsibilities of statistical production. Typically systems vary from a single national institution responsible for all official statistics, a centralised approach, to one of several institutions with a shared responsibility in the production of official statistics, a decentralised approach or something in between.

The importance of pooling expertise, knowledge and technologies exists regardless of the degree of centralization. On the one hand, a centralized statistical system may have difficulty encompassing all the initiatives and demands of the SDG process as well as the nature of SCP initiatives taken by governments and other actors.[3] On the other, a decentralized system may face increased constraints in maintaining the integrity of statistical compilations, and coherence of the system. Both will face transaction costs and problems of information asymmetries associated with different types of technical expertise. Moreover, both require substantial additional resources to deal with new reporting requirements.

Already statistical offices and national ministries around the world are involved in several different international reporting schemes, either through conventions, regulations or voluntary agreements. These commitments require the provision of statistics to be delivered, and are therefore an important source of information. However, it also presents a problem since many countries who currently report are using different reporting systems and standards, between and even within countries. This is a major issue for low and middle income countries. Therefore, any new efforts to demand

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[3] A recent study in Chile identified 147 SCP initiatives across 30 different Government Agencies (MMA, 2016)

additional reporting requirements for countries must recognize the need to work within existing, coherent and consistent, statistical, frameworks.

BOX 2.1. National Statistical Systems in Latin America

In Latin America there are three different models of administration of statistical systems. These are centralized, semi-centralized, and decentralized.

Centralized Model: In this model, the National Statistical Office is responsible for compiling, processing, summarizing, and integrating all statistical information. This is the model applied in Brazil, Colombia, Mexico, Panama, and Peru.

Semi-Centralized Model: In this model the National Statistical Office is still responsible for compiling, processing and integrating statistical information. However, other institutions are responsible for the production of specific sectoral statistical information, such as environmental data, and furthermore, the Central Bank is responsible for the System of National Accounts. Such is the case of Argentina, Bolivia, Nicaragua, Honduras, and Venezuela.

Decentralized Model: In this model the development and production of statistics is decentralized across various institutions and organisational units. In this case the formal management of statistics is under the purview of the National Statistical Office. However, other Agencies are responsible for the production of statistics, development of indicators and even the integration of information. Furthermore, mostly the Central Bank is responsible for the National Accounts. This model has been applied in Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Paraguay, Dominican Republic, and Uruguay.

Source: Oleas, 2013

2.2 Indicators

Indicators are developed to summarize and transform institutional, policy, scientific and technical data into fruitful information that serves a specific objective. Indicators can provide a sound basis for decision-makers to take a policy decision on present, as well as potential, issues of local, national, regional and global concerns. Environmental indicators serve to assess and monitor concerns related to environmentally sound development and, in the case of the SDGs, tracking both policy changes and environmental impact across time. They are typically meant to represent a subject area that is possible to describe in a much broader fashion, by indicating some specific trend that is seen as particularly revealing, typical or summarising a broad field.

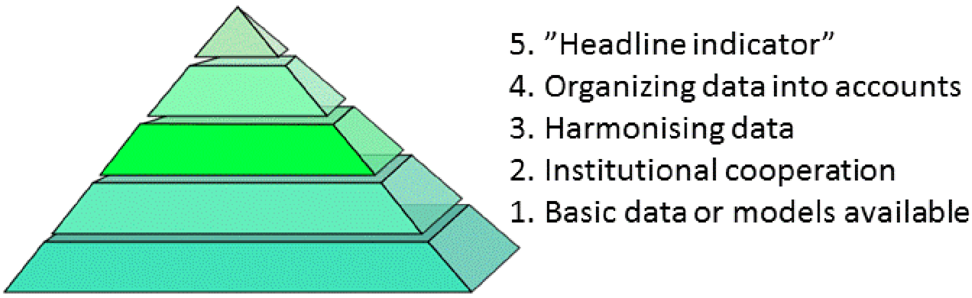
While a data source may be a simple measure (e.g. production of waste), it acquires the notion of indicator when it is related to a broader concept (e.g. production of waste represents environmental pressure). Thus it is important to relate and specify the direct relationship between the measure or variable with the broader concept it is intended to represent or ‘indicate’. In some instances it is not possible to judge whether a positive change in the indicator should be regarded or interpreted as a sign of a positive or negative development (for example measuring a higher production of waste because the waste management system has been formalized and thus is registered). Therefore, additional information may be necessary.

In short indicators are produced to inform and monitor change, and if they do not do so clearly and unambiguously they do not serve their purpose. There is no added advantage in making indicators complex, but there are substantial advantages in conceptualizing indicators within the context of a broader accounting framework. An accounting framework not only specifies how different information is related, but also establishes protocols and criteria of how statistical information should be constructed, thus facilitating the permanent and consistent production of indicators.

This, in turn, generates efficiencies in developing, constructing, and reporting indicators and can help modelling efforts.

To achieve quality indicators they must be based on an integrated system of statistics, here pictured as the 'building blocks' of indicator construction. The model is presented in Figure 3.1 showing an idealized process in indicator construction, involving 5 steps or levels. Level 1, refers to the basic data. Level 2, represents institutional cooperation, where Agencies need to harmonize their respective data sources into one framework. Level 3, involves processing the data by means of a harmonized approach. Level 4, refers to the specific accounting framework to conceptualize the information. Finally, Level 5 is associated with the analysis of the indicators derived from the process.

Figure 2.1 Building blocks towards an integrated information system



Adjusted from UNSD 2015b

A critical component of the success of establishing an integrated approach of constructing the indicators is the need for inter-institutional cooperation at the national level. The diagram above presents an 'idealized' framework involving the production of statistics, the integration of information, and the construction of a specific indicator. However, as was discussed above, in some countries, this may involve multiple institutions and organisational units. This would suggest that a more accurate representation of indicator construction is that many of the building blocks outlined above will be fragmented. Moreover, even in countries that have a centralized statistical model, the interdisciplinary nature of the SCP indicators will require the National Statistical Office, at least initially, to capture basic statistical information through various sources and institutions, as well as acquire additional technical expertise[4].

Therefore any capacity building strategy must recognize the institutional issues raised by the construction of SDG indicators in general, and SCP indicators in particular. Innovative proposals that facilitate inter-institutional coordination and diminish the transaction costs of indicator development are essential for the success of the SDG process. Such arrangements will underpin the extensive monitoring and reporting that governments will need to stay on track to achieving SDG targets. With international agencies collecting data from nation-states and other qualified actors, the work on the SDGs can become a facilitator to create synergies and added value including show-casing successful institutional solutions (UNSD 2015b).

4 For example, in Sweden, the data needed to calculate the emissions to air come from basic energy statistics that are the responsibility of the Energy Agency, basic agriculture statistics from the Agricultural agency as well as air emissions from transportation that is being modelled by the Swedish Traffic authorities. These are carefully harmonised with the methods used for reporting national emissions to various conventions that are under the responsibility of the Environmental Protection Agency. This work thus involves four separate governmental departments.

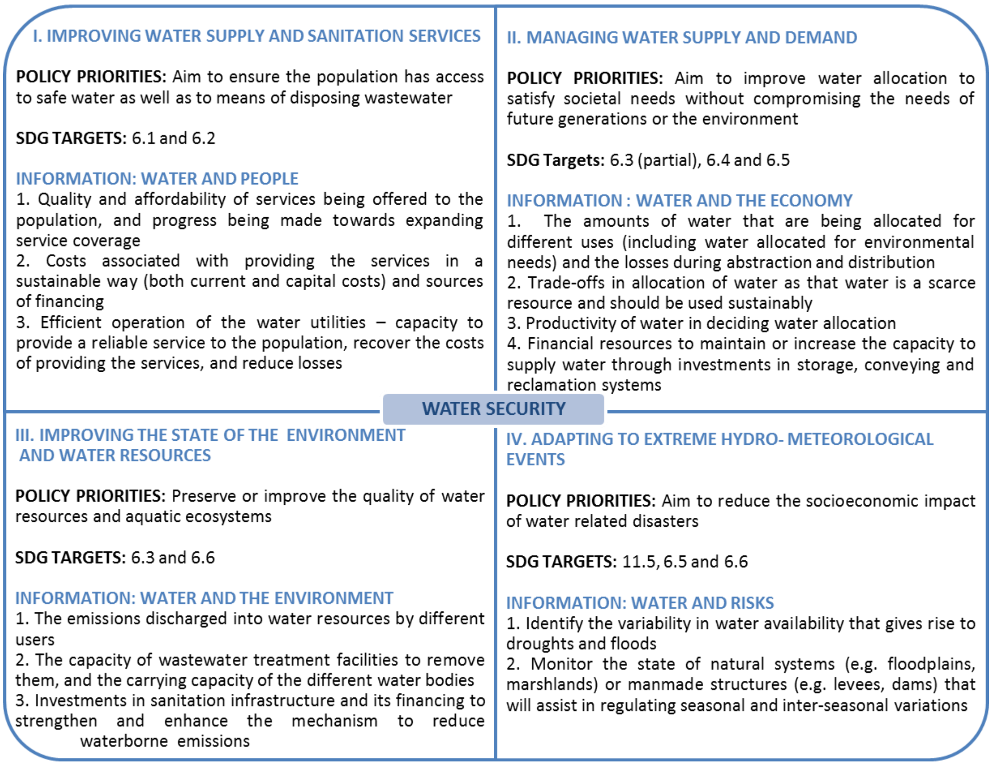
BOX 2.2 An example of relating the SDGs to SEEA – water

Here is an example of relating the SDGs to SEEA. Water issues are treated explicitly in Goal 6 (*Ensure availability and sustainable management of water and sanitation for all)*, but are also covered in the targets of Goal 11 (*Make cities and human settlements inclusive, safe, resilient and sustainable).*

In UNSD 2015b an example of how the SEEA touched upon different targets of these goals related to water is explained by sorting the areas into four main areas:

1. Improving water supply and sanitation services
2. Managing water supply and demand
3. Improving the state of the environment and water resources
4. Adapting to extreme hydro-meteorological events.

Figure 2.2 Policy Quadrants, SDG targets and Corresponding Information Needs



Source UNSD 2015b

2.3 System of environmental-economic accounts

The SEEA Central Framework is a statistical accounting framework that expands the logic of the System of National Accounts (SNA, 1993) to the environment and its contribution to the economy. It applies a conceptually consistent and coherent accounting structure to the organisation of environmental information.

Indicators for the Sustainable Development Goals, are a recent addition to the increasing international demand for compilation and reporting of environmental information[5].

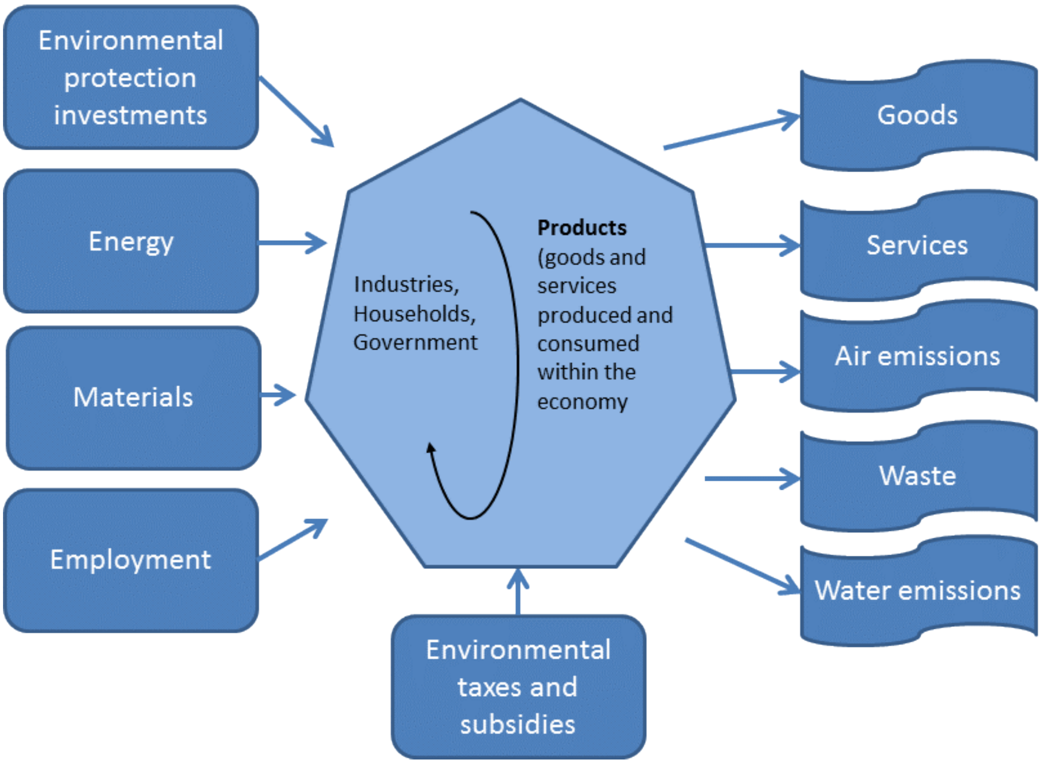
In this regard, a number of international programmes, such as the OECD's Green Growth strategy and the World Bank initiative on Wealth Accounting and Valuation of Ecosystem Services (WAVES) have adopted the SEEA as the statistical framework underpinning their work. This is with the aim of mainstreaming the standard for the reporting and follow-up of environment statistics by countries.

Figure 2.3 depicts some of the components of what is captured within the SEEA framework. The statistical framework can measure necessary inputs to operate the economy; for example, capital investments, energy products, materials, and labour. They may be measured either in tonnes of materials, terajoules of energy input or in capital investments in monetary terms. The economy itself buys and sells products to make production possible, measured through intermediate consumption, output for industries or GDP for the total economy. The government interacts with both companies and households through environmental economic instruments, such as taxes and subsidies, captured in the statistics in monetary terms. The final use from these activities is goods and services, bought by consumers, governments or stored as stock, measured in monetary terms, as well as waste and emissions measured in tonnes or cubic meters[6].

[5] E.g. the "Green Economy" of the United Nations Environmental Program; "Green Growth" strategy of the Organization for Economic Cooperation and Development; the European Union's "Beyond the GDP" initiative; and the initiatives set forth in the framework of the Convention on Biological Diversity, among others.

[6] SEEA explain these measurement aspects as e.g. physical flows (inputs, products and residuals), monetary flows (transactions of money embedded in the SNA) and stocks (natural assets). More technical descriptions of the SEEA are available in the SEEA CF.

Figure 2.3 Some important environmental and economic components described by the SEEA



2.4 Social aspects in the SEEA

Further work is required to develop indicators on social issues that bridge the gap between the economy and the environment. Studies show that information such as work environment, employment, gender and education levels can be included within scope of SEEA and in the context of ecosystem accounts and spatial analysis (SCB 2005, ABS 2012). This is something that is not further discussed in this report but is for future consideration. Examples of connections that are already part of the environmental accounts in Sweden are constructing green industry employment indicators, i.e. in the environmental goods and services sector. Also the statistics on environmental pressure from consumption can be divided by household income groups, gender and similar variables.

SCB have done pilot studies on how to include general social statistics in the accounts by using the data on where people are employed (SCB, 2005). This has enabled a proposal for macro set of indicators similar to what is reported for companies' "triple bottom line" reporting.

Since the SEEA is designed to fit many of the standard economic models, including through the input-output structure and the industrial classification system (ISIC), it is possible to align data with social statistics such as employment, income, education levels in the work force. Currently this is not viewed as part of the SEEA. Another example that is not part of the SEEA is information about environmental impacts on population health.

In order to assess environmental hazards that affect people's health or lives through releases of chemicals or air pollution, there are models set up outside of the statistical offices that are better at handling the complexities of how exposure to contaminants affects the population. Here statistics can serve as data input to the models but they are not enough to arrive at policy-orientated conclusions. In such cases further research and organisations outside of the statistical institutes are vital in the process of indicator development and reporting.

Poverty and equality are possible to measure through the statistical system, especially through social statistics but also through the national accounts. This is not generally speaking, an area where the SEEA community has expertise.

The accounts - including national accounts or environmental-economic accounts - have their main strength in connecting social data to production and consumption activities. That means investigating how driving forces like production and consumption are connected to the population through employment or consumption patterns. They can also show natural resources use in the production and consumption chain and how the State influence economic, environmental or social outcomes through taxes and subsidies.

The environmental-economic accounts are less valuable as an information tool when it comes to indicators where the connections to production and consumption are less prominent or have to be modelled or measured directly. This can be the state of the environment (e.g. concentration of emissions in air or water, that needs to be measured directly), or the social issues (e.g. poverty, unemployment, sickness, victimization).

Statistical modelling of the interactions within the social sphere to achieve measurements such as healthy life years, are important frameworks that will also be needed to understand the interactions between the social, economic and environmental factors and how they affect people's lives. However, they are outside the environmental-economic accounts. Likewise, indicators on democracy and rule of law are also outside of the accounts framework.

3. SCP indicators for the SDGs

The Inter-Agency and Expert Group on Sustainable Development Goals (IAEG-SDG) has been tasked by the United Nations Statistical Commission (UNSC) to develop indicators for the Sustainable Development Goals[7]. Recognizing the difficulties countries have in reporting consistent indicators, it is important that the proposals ensure that as many as possible of the indicators comply with statistical frameworks and generally accepted properties.

It has been suggested that headline indicators (i.e. those that provide a general overview of a trend, but do not necessarily explain it) should be used in order to make SDG follow-up manageable and more transparent. However, it is still important that indicators explain general trends. Thus, a second level of indicators can be considered that provide in depth analysis or identify essential factors that explain important trends. Identifying key indicators that serve multiple objectives and targets is an important step in facilitating the monitoring of progress towards the SDGs.

To date the IAEG is working towards an informative indicator base to evaluate the progress towards the SDGs. A long list of indicators have been discussed within this group considering the trade-offs between the best indicator for specific targets within goals, data availability, and data quality. The suggested indicators range from those currently available from national statistical systems, international organizations, and academia to those currently being developed in the statistical community, to others not measured by statistical offices but available through research studies, models and national ministries on monitoring the process of attaining the SDGs.

With respect to sustainable consumption and production indicators, the current proposals discussed in the IAEG range from those that can be monitored through statistics (e.g. waste generation) to those monitored by models (e.g. consumption based material flows). Some indicators proposed are not within the scope of statistical frameworks (e.g. as mentioned above, number of countries implementing policies and action plans).

In this report we further develop and adjust the list of indicators proposed in UNEP 2015 report from a statistical perspective, focusing on the applicability of the proposed indicators as they relate to the SEEA. The results are described in annex 3. The evaluation has also taken into consideration the criteria for data quality explored by the work on developing indicators as from the UN Committee of Experts on Environmental Accounts (UNSD 2015c).

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[7] http://unstats.un.org/sdgs/iaeg-sdgs/

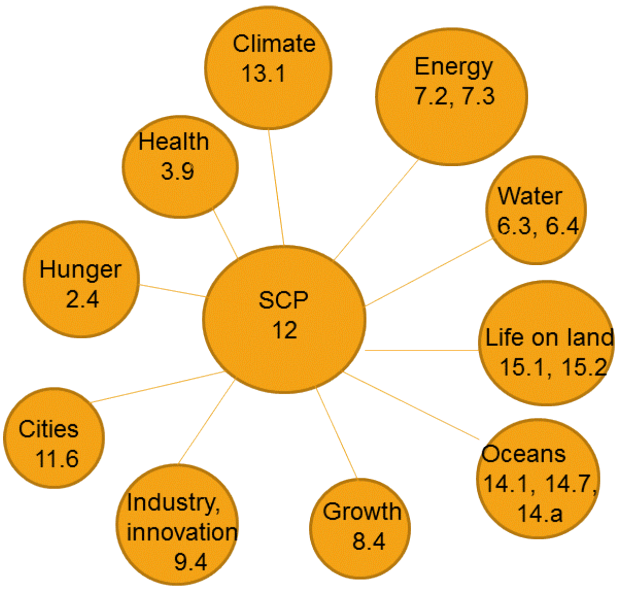
3.1 Connecting statistical frameworks to the SDGs

Following LeBlanc (2015), we argue that the SDGs are integrated with one another, and that sustainable consumption and production patterns are a key dimension across almost all goals. Further, that Goal 12 on SCP, along with Goal 10, on inequality, are significant in that they connect to other goals through common targets (LeBlanc, 2015). The linkages through these two goals and common targets serve to make the SDGs a more cohesive and synergistic framework for action, especially as these two goals share targets with a number of other SDGs. With this in mind, indicators that can be constructed from the SEEA can be used to measure several SDG targets, due to the link between the environment and economy as the central focus of the SEEA.

Other SDGs, connected to sustainable consumption and production patterns, encompass, in principle, goals that can be represented by indicators provided within the SEEA. Achieving SCP is linked to at least one or two targets within those other goals.

Figure 3.1 depicts the SDG goals and specific targets that can inform data aligned with the SEEA. This report focuses only on the environmental-economic accounts and indicators within the scope of national accounts or other social data not touched upon further, even though they might inter-connect with Goal 12.

Figure 3.1 Sustainable Consumption and Production – targets highlighted in this report



The integration of environmental, natural resource and economic data to monitor the SDG goals can be exemplified by figure 3.2. In this figure, essential statistics from different statistical areas are jointly combined. In the environmental-economic profile there is data on a range of important environmental pressures like waste, carbon dioxide, nitrogen oxides and particles and sulphur emissions. There is also data on resource use, like biofuels and fossil fuels. And last but not least is shows economic data like vehicle tax, carbon dioxide tax and energy taxes that affect the relative price of environmental pressure. The profile expresses the national contribution in percent of the total of the service industry and the producing industries respectively. Since the environmental pressure is tightly linked with energy use and the service industry in general uses less energy than the basic producing industry they will have different profiles.

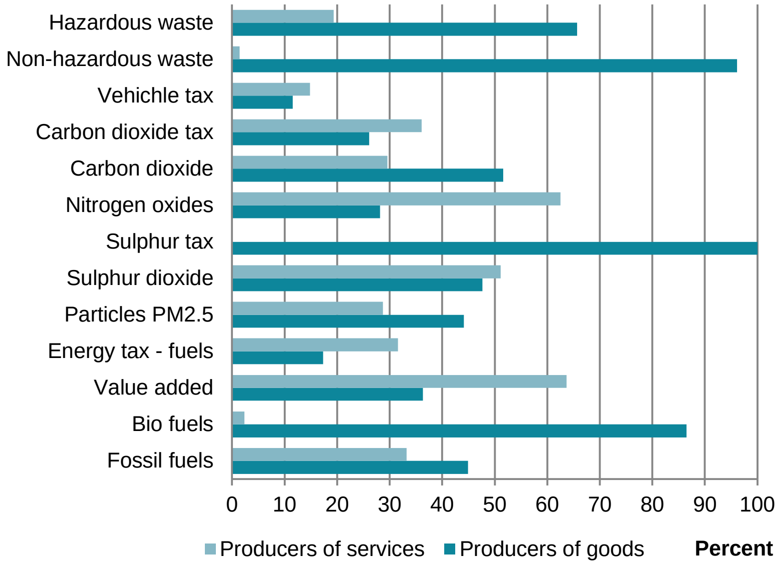
It provides the reader with information ranging from taxation system, to air emissions, and economic contributions from, in this case the Swedish economy. The data in this figure comes from the national accounts and environmental-economic accounts.

Environmental economic profiles are one way to look at the contributions of different actors to environmental pressures, the economy, and different ways to compensate and adjust for the pressures through, for example, taxation. For example, the general and quick overview is given that the production of goods is more energy intensive and that they are producing more waste than the service producers. On the other hand the service producers pay higher taxes on air emissions and are on par with producers of goods with regards to emissions of sulphur dioxide.

In terms of their relevance to the SDGs are embedded in the share of gross value added (industry's contribution to GDP) of industries (goal 8). In the Swedish case the GVA of economic activities producing goods has a lower share than that of producers of services. The same data set can be followed in times series monitoring the decoupling of economic growth to air emissions.

The uses of fuels are monitored in goal 7 and the figure below indicates that in Sweden fossil fuels are almost equally used by either producers of goods and of services. By this information it is possible to model impacts if changes in the use of fossil fuels are to be reduced. Air emissions monitored in goal 13 are highly relevant in the figure below, indicating who the emitters in combination with environmental economic instruments are. And with regards to goal 12 the figure visualises the economic structure of the combined production, environmental pressure and environmental economic instruments in place today and who they impact on.

Figure 3.2 Environmental-economic profile, example from Sweden, by industry groups (NACE/ISIC)



Note: Producers of goods include NACE: A-F (e.g. agriculture, mining, manufacturing, waste water and waste management, construction, electricity. Producers of services include: NACE: H-U (e.g. transportation, financial and insurance, real estate, public administration, health)
Source: SCB 2015

4. Exploring SEEA indicators associated to relevant targets

Monitoring sustainable consumption and production patterns will require building statistical capacity in many countries. For some it may be that new building blocks such as specific environmental statistics will be needed, but the challenge for most countries is to connect already existing data sources into a common system.

In Table 4.1 a list of data sets are proposed that can serve to compile indicators informing multiple targets. They differ somewhat from the process indicators currently proposed within the IAEG in the sense that they monitor the actual change of emission, investment and consumption levels rather than measuring implementation activities. They also allow more detailed analyses of the underlying driving forces and responses from the economy as a whole.

The present section of the report only sets out a one example of such indicators. The rest of those covered by this report, and referred to in table 4.1, are to be found in **Annex 3**.

4.1 Macro indicators for SCP

The process of developing indicators for the SDGs is currently ongoing within the Inter-agency Expert Group on SDG Indicators (IAEG). It is anticipated that the statistical community will take a decision on a range of indicators that has been developed and proposed by the IAEG in collaboration with stakeholders around the world.

The indicators proposed, covering Goal 12, as well as key SCP-related targets in other SDGs, show the link with other goals. This approach has the aim of making the set of indicators as useful as possible for as many targets as possible.

Presented in Table 4.1 are the possible data sets necessary to construct the indicators. The proposed data sets consider a macro perspective - precision may, therefore, be lost with respect to some measures or activities. However, there are obvious gains in terms of the connection with other data sets. For example, although it will not be possible to distinguish life-cycle assessments for particular products or activities, it is possible to gather environmental-economic information of industries or households that is comparable internationally. The table also depicts statistical areas where there are current indicators proposed and from where the underlying data sets might come.

4.2 Commonly disseminated SEEA based statistics

The data sets proposed in this report aid the measurement of the progress of the outcome of several goals. As described in chapter 2 and 3 the SEEA has the capacity to be functional across many goals and targets. Considering that work on SEEA is expanding globally the potential of finding new data sources is also ever increasing.

Fourteen data sets that can be derived from the SEEA Central framework have been selected in this report as an initial input to the discussion on monitoring SDGs, covering the monitoring of production patterns in relation to both emissions and the use of natural resources, changes in technologies, consumption patterns and the use of environmental economic instruments. These can be the foundation to construct subsequent indicators with further data from the national accounts, for example, on consumption patterns in relation to poverty and from social statistics on education and family.

Each data set presented in Table 4.1 is drawn from the national accounts (SNA) and the environmental economic accounts (SEEA) framework. By this it is meant that established guidelines and definitions are available. However, data availability varies across countries. In general the data is most commonly available in Europe, Canada and Australia[8]. The definitions and scope of these indicators are further described in **Annex 2** and all the indicators are visualised and explained in **Annex 3**.

Each data set can be used to construct indicators that meet two or more targets within the SDG framework, since they relate so intimately with the issues of sustainable consumption and production patterns. In most cases these data have target 12.2 - *Achieve sustainable management and efficient use of natural resources*- at the core.

There are already a number of indicators proposed within the IAEG process that take into account the connection between the economy and the environment. Table 4.1 shows which data sets are already included in the IAEG process and for which target. For example, the indicator “GHG-emissions from the economy per unit of GDP” identified in the IAEG report for target 7.a[9], could also be appropriate for Goal 13 on climate change. This indicator could be measured using the SEEA, but it is also possible to use the GHG-emissions reported to the IPCC, with geographical boundaries rather

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8 More information about which country is doing what is available through e.g. INESAD 2015, *Global Green Accounting 2015: The first annual annotated bibliography of green national accounting efforts around the world.*

9 Annex 1

than economic boundaries, as this is the most established and well-known data source.

Many countries are already producing time series in many areas within the framework of SEEA. Eurostat collect data within the capacity of EU-regulations and publish regularly the results. The areas covered range from physical flow accounts such as air emissions, energy and material flows, to the monetary side of environmental taxes and environmental protection expenditures[10].

Sweden has been compiling SEEA data for over 20 years (SCB, 2015) and policy use and interest from analysts is increasing[11]. However, there are a range of SEEA related areas which are still in development, and which are not yet covered by the Statistical Standard but which do concern the SDGs. For example, management of land and water ecosystems is an experimental area, results from which could potentially be of great value for measuring Goals 14 and 15 on marine and terrestrial ecosystems[12]. The table indicates that potential data sources might be available. The statistical areas could in turn have been compiled using several methods, such as through conventional surveys, by the use of administrative registers, to models and other estimation procedures.

Another area of research is environmentally harmful subsidies, where there are pilot studies that connect accounts at the national level but, as yet, there is no internationally harmonised reporting. In this case, the OECD and IEA are producing some statistics with regard to fossil fuel subsidies that can be valuable for the SDG indicators.

To illustrate, Figure 4.1 presents data on “greenhouse gas emission intensity” for the EU between 2000 and 2012, one of the indicators proposed in this report. Greenhouse gas emissions are the drivers of climate change, so naturally greenhouse gas emissions is an important indicator to monitor the targets identified in SDG 13, on climate change.[13] But excessive or increasing greenhouse gas

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[10] More information about EU regulation 691/ 2011 on Environmental Economic Accounts, consolidated version can be found here:
http:/ / ec.europa.eu/ eurostat/ web/ environment/ overview

[11] A paper is available on how the environmental-economic accounts are used in Sweden:
http:/ / www.unece.org/ fileadmin/ DAM/ stats/ documents/ ece/ ces/ ge.33/ 2015/ mtg2/ S2_background_paper_SE.pdf

[12] These topics are being developed in the SEEA Experimental Ecosystem Accounting which countries are currently testing.

[13] A combination of air emissions from carbon dioxide (CO_2), methane (CH_4) nitrous oxide (N_2O), and fluorinated gases (CFCs) which are calculated into CO_2 equivalents.

emissions also suggest inefficiencies, and represent an economic loss and/or unsustainable production patterns. Therefore data on greenhouse gas emissions can, potentially, be used as the basis of indicators to inform targets: 8.4, 9.4, 12.2 and 13.1[14]. By associating emissions with specific industries as is presented in Figure 4.1 it is not only possible to explore infrastructure and efficiency issues, but also guide policy.

The indicator presented in Figure 4.1 provides insight into which sector, in the EU, contributes to climate change. It also shows that most industries in the region are becoming more efficient, i.e. they are reducing the amounts of greenhouse gases per euro earned. It also provides information on the ratio of economic production to climate change in terms of the producers of goods and services.

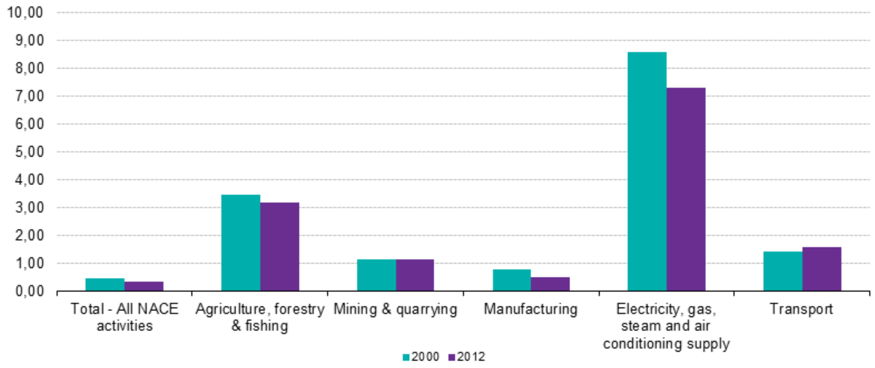
By monitoring the industry greenhouse gases emissions in one country or region it is possible to guide policy towards upgrading infrastructure or retrofitting industries. The indicator provides evidence on who is changing and where progress is necessary.

Depending on the objective there are different ways to present information or construct an indicator. In the case of Figure 4.1 it is possible to explore relative industry efficiency, but constructing the indicator in a different way may provide information for other objectives or targets. For example greenhouse gas emissions can be presented in terms of total emissions by industries, similar to that of Figure 4.1, or per capita emissions, or total country emissions. These are different, useful indicators, providing additional information, and constructed using essentially one data set.

By using an indicator connected to the SEEA, it is possible to explore other issues further opening a number of new analytical avenues. In the case of the indicator presented in Figure 4.1, by associating emissions to National Accounts definitions it is possible to explore greenhouse gas emission intensity as they relate to production, income, employment, backward and forward linkages (i.e. input-output models). This will significantly facilitate international comparisons. In short, by associating one environmental data base – greenhouse gas emissions- with categories and classifications, it is possible to explore a wealth of additional information, as well as monitoring a number of possible targets.

14 See Annex 1 for definitions

Figure 4.1 Greenhouse gas emission intensity by economic activity, EU-27, 2000 and 2012 (kg of CO2 equivalents per euro)



Source: Eurostat statistics explained

Table 4.1: Suggestions of SEEA related datasets to monitor SCP

Data sets	*Detail possible within SEEA*	*Additional detail*	*Targets measured**	*Current target in IAEG-SDGs* **	*Potential Data Source for compilation*
Tracking changes in production patterns - pollution and economy					
GHG-emissions from the economy	Industries, government, households	Divide by value added/GDP, per capita	*8.4, 9.4, 12.2, 13.1*	*9.4, 12.2*	*GHG Inventory, energy statistics*
Emissions to air (PM2,5)	Industries, government, households	Divide by value added/GDP, per capita or focus on cities	*11.2, 11.5, 11.6, 12.2,*	*11.6 to a certain extent*	*PRTR or emissions inventories*
Emissions to water, e.g. N, P, zinc, lead	Emitted by industry. To recipient (wastewater treatment plant or back to the water system (i.e. surface or groundwater, sea, non-point sources)	Divide by value added/GDP, per capita, type of treatment plants	*2.4, 6.3,12.2, 14.1*	*Not included*	*PRTR or emissions inventories*
Use of chemical products	By industry and households	By toxicity classes	*3.9, 12.2, 12.4*	*Not included*	*PRTR*
Tracking changes in production patterns - natural resources and economy					
Amount of waste generated	By generating industry, by receiving industry	Divide by value added or GDP, Type of treatment plants	*3.9, 11.6, 12.2, 12.5,*	*Part of 11.6, 12.4*	*PRTR, waste statistics*
Material use	By material category, by industry, households	Divide by GDP or per capta, linking it to hazardous materials	*8.4, 12.2*	*8.4, 12.2*	*Sectoral data and statistics*
Energy use	By industry, household, government, by energy source (including renewable sources)	Divide by per capita, value added/GDP or GHG	*7.2, 7.3, 8.4, 12.2,*	*7.2 to a certain extent, 7.3, 7b*	*Energy statistics, Energy Balances*
Water use	Industry and households, government, by source	Divide by per capita or value added/GDP	*6.4, 12.2, 13.1*	*6.4*	*Water statistics*
Tracking changes of environmental technologies					
Environmental protection expenditure	By industry, households and government by type of env. area and type of investment	Divide by GDP, value added	*3.9, 6.3, 9.4, 12.2, 13.1, 15.1*	*Not included*	*Sectoral data and statistics, surveys and administrative data*
Value added in environmental goods and services sector	By industry and government, or by env. area	Divide by GDP, value added	*3.9, 6.3, 6.4, 7.2, 7.3, 9.4, 12.2, 12.b, 13.1, 15.2, 15.1*	*Not included*	*Sectoral data and statistics, surveys and administrative data*
Tracking changes in consumption patterns – environmental and natural resource pressures					
Environmental pressure from consumption – materials	Products	Trade partners	*12.2, 8.4*	*12.2*	*Input-output tables, trade statistics, material flow statistics*
Environmental pressure from consumption – GHG emissions	Products	Trade partners	*12.2, 8.4, 13.1*	*Not included*	*Input-output tables, trade statistics, GHG emission accounts*
Tracking changes of environmental economic instruments					
Environmentally related subsidies	By industry, households, by type, GDP or per capita	details of related subsidies to RoW	*6.a, 7.2, 7.3, 7a, 9.4, 12.2, 12.a, 13.1, 14.7, 14.a, 15.a, 15.1*	*6.a, 7a, 15.a*	*Financial statistics*
Environmentally related taxes	By industry, households, by type	Divide by per capita or GDP	*12.2, 13.1*	*Not included*	*Financial statistics*

*Targets measured as evaluated by this project
**As of 18 February 2016

5. A strategy for capacity building and institutional arrangements for compiling and applying SEEA compliant SCP-related indicators for the SDGs

5.1 Experience with Capacity-Building for International Reporting

The UN Statistical Commission (UNSC) and the UN Coordination Committee on Statistical Activities (CCSA) are the official international governing bodies concerned with addressing technical and coordination issues related to statistical development at the international level. However, in light of increasing global reporting requirements and especially the implementation of the Millennium Development Goals (MDGs), there has been increased concern over the capacity of national statistical systems to address these requirements. Therefore the international community has implemented various global initiatives to support countries in upgrading their national systems.

Among the most significant initiatives was the Marrakech Action Plan for Statistics (MAPS) and its associated projects namely: the Partnership in Statistics for Development in the 21st Century (PARIS21), and the Trust Fund for Statistical Capacity Building (TFSCB).

These three related programs share the goal of improving statistical capacity, and promoting the use of statistics in developing countries. Other global initiatives include the UN MDG Indicators Expert Group[15] and now the Expert Group on SDG Indicators (IAEG-SDGs), General Data Dissemination System (GDDS)[16], and the STATCAP[17].

The Marrakech Action Plan (MAPS), proposed six key actions for improving development of statistics which include:

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[15] Convened by the United Nations Statistics Division and the UN Development Programme, the meetings of this group have brought
together the key agencies involved with the production of data to support the MDG monitoring

[16] The IMF's GDDS encourages countries to evaluate their macroeconomic, financial, and social sector data using an internationally agreed framework.

[17]A World Bank lending program for statistics designed to provide the resources needed to build a long-term sustainable statistical system in support of countries' statistical capacity projects.

- Mainstream strategic planning of statistical systems, especially through the implementation of a National Strategy for the Development of Statistics (NSDS)[18];
- Prepare for the 2010 global round of population censuses;
- Increase the finances for statistical capacity building;
- Set up an International Household Survey Network;
- Undertake urgent improvements for MDG monitoring; and
- Increase the accountability of the international statistical system.

The idea behind MAPS, PARIS21, and TFSCB was to improve the capacity of developing countries to compile and use statistics. The commitments for statistical capacity building have been further emphasized in the Busan Action Plan from 2011. While these initiatives have yet to be fully evaluated, preliminary reviews suggest only moderate progress on the activities and outcomes set out by the three programs (IEG, 2011). Conclusions from the reviews suggest progress in supporting developing countries in constructing National Strategies to Develop Statistics (NSDS), but much work remains in actually implementing these strategies. Expected results have been limited partly by a national and international community that is still not committing the necessary resources to build statistical capacity at the relevant levels.

The IEG 2011 review found that lack of progress is explained by:

"(a) insufficient attention to implementation challenges facing the NSDS process; (b) the absence of a strategy to help stimulate demand for better data at the country level, not only among government users but also from other domestic stakeholders such as the civil society, NGOs, research institutes, and the media; and (c) inadequate albeit improving attention to the support for statistical capacity among the donor community" (World Bank, IEG, 2011).

With respect to countries reporting capacity, a relevant point of departure for the case of the SDGs is what happened with the reporting commitments of the MDGs. Many observers concur that the Millennium Development Goals helped and encouraged many countries to improve their reporting capacity. However, despite important progress, particularly in lower income countries, a significant MDG data gap remains (Chen et al, 2013).

This experience was across the board, even in higher income countries. Latin America presents an interesting case since it

[18] The NSDS were identified as a key framework to help countries access funds, mainstream statistics in national policy and facilitate necessary institutional reforms.

provides a sample of many countries with different levels of development. Evaluation reports confirm substantive differences in the capacity of countries to comply with the reporting requirements, but in most cases, the capacity of the region to systematically provide adequate indicators, was weak (Cervera, 2005).

Developing and producing indicators for the SDGs in general, and SCP in particular, will pose more challenges. In comparison reporting of the MDGs was relatively straightforward. The MDGs were narrow with a limited number of targets and headline indicators. Furthermore, they were constructed on the basis of relatively well developed statistical sources, on which statistical agencies had considerable experience. These included housing and population census, household surveys, water and sanitation registers, and education registers. However, countries still struggled to comply with the reporting requirements (Sanga, 2011; Kiregyera, 2007; 2010; Ware, 2011).

Another issue relates to the indirect effect of increased demands on reporting specific indicators. In some cases the MDGs may have further constrained statistical offices' limited economic and human resources in other areas. Jerven (2011) argues that, in the case of Africa, MDG data collection compromised the efforts in other data collection activities, analysis and dissemination. Due to the significant reporting burden that the SDGs imply, and the range of objectives and targets involved, increased reporting efforts for them may have the un-intended effect of reducing long-term statistical capacity applied to other important tasks.

For this reason it is important to consider new capacity building efforts, and in particular consider them in terms of improving not only countries' specific SDG´s reporting capabilities, but overall statistical capacity. In the long term this will better serve the reporting requirements of the SDG's. For this reason there is a clear need to view SDG indicators, and capacity-building in light of a consistent and integrated accounting framework as well as supporting broad statistical capacity. For all its limitations and complexities the SEEA provides such a framework.

5.2 Key capacity-building issues related to statistical systems

While it is easy to identify funding as the major constraint in developing statistical systems, as in many other policy issues, if major structural problems are not considered additional resources may not resolve the problems identified. In the case of statistical capacity, studies identify a series of issues faced by countries that can be considered major bottlenecks in the production and development of indicators.

1. Data availability

One major problem is that the data is simply not available. Many scholars report lack of data availability in the case of development data and especially MDGs (Bizikova, et al, 2015; Sanga, 2011, Kiregyera, 2007, Boerma, J. T., & Stansfield, S. K. (2007). Chen et al (2013), argue that over half the countries do not report at least a third of the MDG indicators. Undoubtedly this will be compounded in the case of the SDGs, which are not only more complex, but more significantly involve goals, such as SCP, where there is little available information, or at least little recognition and centralized compilation of the useful data that is available from multiple sources.

Without a doubt countries must direct new resources to capture, collate and analyse new data, particularly in the environmental sphere. One area of potential data information which has to be explored more significantly is administrative data which is still not used as often as possible. PRTR systems, for example, are extremely underused and provide a wealth of information that requires further research to make it useful, especially in developing countries.

2. Institutional Coordination

In many cases the data is available but due to limited institutional coordination or lack of capacity the relevant agency does not capture or publish the necessary information. A particular problem is the reconciliation of multiple data sources (Chen et al, 2013; Sanga, 2011, Kiregyera, 2007, Boerma and Stansfield, 2007). Some scholars point to the need of establishing National Statistical Plans, and in effect the international community has made efforts in this area. However, as was mentioned above, when national plans are developed they are later not implemented effectively.

In the case of SCP, and in general environmental data, the information is gathered from a range of organizations with multiple objectives and interests. Therefore, institutional coordination through plans, committees, or other ad hoc structures may be essential to capture the required information.

3. Data quality and comparability

Another issue is that when data is available, produced and published, due to the different classifications or definitions it is not possible to reconcile, and is therefore of no use for global reporting. Other relevant problems involve the quality, disaggregation and periodicity of the data constructed (Chen et al, 2013; Sanga, 2011; Kiregyera, 2007).

When dealing with new issues, such as SCP, comparability will become a major problem. Often data will not be available and models or estimates must be made - for this international standards and methodologies will be necessary.

4. Resources and Technical Capacity

While resources are always limited, it is essential for international initiatives and donors to consider funding for statistical-capacity building. Often National Statistical teams are underfunded and with limited technical capacity. Furthermore, in the case of a decentralized National Statistical System, it is often sectoral agencies that require funding and expertise to develop and produce appropriate indicators.

The 10YFP is a similar case in point. Whereas UNEP has been able to develop and fund an international programme to support SCP projects on the ground, there is limited funding for institutional development and the construction of indicators. Here, as in other international initiatives, small grants to support indicator development may be essential for statistical capacity-building.

5. Data Use

Finally it is essential to keep the eyes on the prize. The purpose of generating more data and perfecting indicators is for them to be used. If the SDG indicators are only used for global reporting, as seems to be the case for MDGs, they will have little impact in increasing statistical capacity nor in enhancing and sustaining evidence-based policymaking (AbouZahr, et al, 2007; Chen, et al, 2013; Sanga, 2011, Kiregyera, 2007; Boerma and Stansfield, 2007).

In light of these issues, a capacity-building strategy is proposed that recognizes that as the objective of shifting to SCP patterns will be implemented across a range of different organizational units, effectively implementing the necessary policies and generating new indicators to track changes requires novel institutional solutions. The main objective is advancing towards an integrated statistical system, which is necessary even in countries with good statistical information. These data sources must be combined to inform integrated and coherent policies in years to come.

Experience has also shown that the costs for setting up an integrated system are not excessive[19]. While an initial investment is needed,

[19] For example, Sweden has since 1996 had the same budget for compiling SEEA, roughly Euro 500 thousand annually for producing and communicating the regular statistics. Additional investments and developmental work have been made over the years through applications of additional funds such as Eurostat grants and research projects.

there are important efficiency gains associated with integrated information for policy making and international reporting. And, further, making policy without the adequate information can generate important costs.

The present paper provides an initial elaboration of a generic national strategy to develop SCP-related indicators for the SDGs, based on the following six steps. This represents an initial proposal, based to a large extent on current experience in Latin America, which could undergo adaptation to other national contexts and in other regions. For each element some initial considerations related to the institutional capacity building required to fulfil each step are developed.

5.3 Recommendations for a capacity-building strategy

1. **Adopting the SEEA Central Framework as the standard accounting system.**

Although it is possible to construct indicators without an accounting framework there are many advantages in developing indicators on the basis of a statistical standard. In general, the main problem without an accounting structure is that the different organisational units develop their own definitions, classifications and methodologies. An integrated accounting structure promotes a systems approach. Although initially more costly, ultimately it is more efficient because it takes advantage of synergies across systems, and the indicators become a consistent and permanent product of the accounting structure. More importantly if different countries adopt the same accounting structure international comparability is immediate.

One of the key problems identified in the case of the MDG´s was the prevalence of different definitions and methodologies of data collection. This is especially the case for data from administrative records, which reflect the administrative procedures of each country, and are therefore less harmonized than data from surveys and censuses (Cevera, 2005). This will be especially relevant for the SCP indicators since, as can be observed from Table 5.1, many of the potential sources of information involve administrative records.

A common statistical framework is especially relevant in the case of decentralized statistical models, where there isn't one central agency integrating or validating the basic statistical information. However, while a centralized model of administration of statistics solves the problem within nation-states, the issue of international comparability remains. Thus a global standardized and agreed upon accounting structure is especially relevant for global indicator development, in particular when the information is highly interdisciplinary and there is still limited international experience.

2. Committing to produce a set of central SCP indicators

As was discussed above a set of central headline indicators may be useful to inform or monitor a number of key targets. By committing to a reasonable number of central SCP indicators, institutional efforts and resources are focussed, comparability is enhanced, and the efforts of developing a broader accounting framework are concentrated on specific issues.

In order to achieve commitment to institutionalised data collection and reporting, formalised arrangements between organisations and institutions might need to be established. In addition, the indicators should preferably meet national strategic requirements as well. As such the producers of the statistics and the users of the statistics should create a platform to discuss existing data needs and future developments together.

3. Relating priority SCP indicators to specific environmental data sources

The present paper has identified a range of different indicators and possible datasets. Further work is necessary once there is agreement on SCP-related SDG indicators, on precisely which environmental data source is necessary in order to construct those indicators.

Since the new information requirements will involve multiple and complex methodologies, special attention must be paid to establishing protocols and criteria with respect to that information.

For example, administrative registers will become increasingly important in providing an important and relevant data source. Governments in all countries collect a large amount of data as a part of day to day administration. The administrative records and other related documents contain a wide variety of data on demographic, social, economic, cultural and environmental topics, such as the PRTR system on hazardous chemicals, for example. This is increasingly used in bilateral development cooperation projects establishing SEEA nationally. The reality is that new data collections are too expensive. In addition the burden on respondents should not increase further. Mapping existing data requires the cooperation of all the stakeholders and the willingness to share information and data between organisations.

The government authorities that are responsible for the administrative processes that operate and maintain information collection and record keeping operations are vested with statutory authority to request the necessary information to ensure public compliance and response. In instances where such legislative provisions support data collection the coverage and completeness of records are usually good. However, administrative registers raise new issues in terms of comparability and consistency. For example, data from a register may be very large, but in order to avoid statistical bias, expansion to the total population may require new methodologies.

4. Developing a plan to perfect and support the production of environmental statistics directly related to the construction of priority indicators

Notwithstanding the need to use current databases, undoubtedly new statistical information will be required. Therefore, as part of the capacity-building agenda, it is important for countries to identify as soon as possible the new environmental statistics production requirements. One proposal is for countries to develop a national plan for the improvement and perfection of environmental statistics.

However, as in the case of development (social) statistics, the increasingly global nature of environmental concerns and initiatives may require further work in developing a global strategy to improve environmental statistics and develop specific actions and initiatives to support nation states in this regard.

5. Promoting coordination and identifying one focal point for reporting and coordinating the production of SCP (and other SDG) indicators

One of the main recommendations that emerged from the MDG process was the need to coordinate across different institutions within countries. However, this recommendation was often not heeded. A way of facilitating coordination is designating focal points. The 10YFP and its programmes are addressing coordination issues, including through the establishment of national focal points on SCP (124 nominated to date). A similar approach may be useful in indicator development.

Furthermore, the following aspects of coordination warrant particular attention:

(a) the identification of actors and the division of responsibilities,
(b) leadership among the institutions that produce information,
(c) the establishment of common technical standards, and
(d) the best use of existing technical and human resources.

6. Exploring the construction of inter-institutional committees to develop and strengthen information capture and the development of priority statistics

SCP statistics and indicators will come from a variety of sources and will be generated by different national institutions. The administrative departments responsible for producing different statistics must therefore be identified in order to undertake SCP follow up activities at the national level. Without collaboration among administrative units, establishing technical standards on data collection and analysis, field work, and dissemination of results will not be undertaken effectively or even happen.

The multiplicity of actors involved in national statistical systems, particularly in relation to SDGs in general and SCP in particular, will require institutional leadership.

Given the nature of environmental statistics and SCP issues the agency in charge of implementing SEEA system is best placed to exercise the technical leadership and serves as the national "statistical clearing house" validating the exchange of data with international organizations. This may not always be the national statistical office, since it will depend on the nature of the institutional system in the particular country. And further types of innovative institutional collaboration may be necessary.

Some of the necessary elements are:

(i) the establishment of technical standards, definition, nomenclatures and survey frameworks;

(ii) the obligation to consult the office before altering administrative records that could be used for statistical purposes;

(iii) the conferral of official status to statistical results; and

(iv) the preparation of national plans of statistical activities.

A case in point is Chile, a highly decentralized model of administration of statistics. In Chile, the National Statistical Office has some responsibility in the production of statistics, but it is mainly under the purview of sectoral agencies. Further, the Central Bank is responsible for National Accounts and the Ministry of Environment is responsible for environmental satellite accounts. To deal with such a fragmented institutional structure Chile has developed a series of institutional innovations. These include:

(a) The adoption of the SEEA statistical framework, through the approval of National Environmental Accounts Plan.
(b) The creation of an inter-institutional committee on environmental information that is responsible for environmental statistics and information.

(c) The identification of an institutional national focal point on environmental statistics and information.
(d) A data infrastructure model that includes a web line service to integrate information, a PRTR system and a clearing house of environmental information.

7. Other structural issues

It is important to emphasize the potential efficiencies that can be generated in the production of statistics and construction of indicators through simple, albeit important institutional reforms. However, it is still necessary to insist on other 'structural' bottlenecks which must be dealt with in order to perfect the statistical system. These include the need for additional:

- financial resources;
- qualified personnel;
- institutional capacity; and
- priority on the political agenda, among others.

Given the interdisciplinary nature of environmental information and technical expertise, and in particular information related to SCP policies and initiatives, it is essential to start thinking about new and novel institutional solutions and show-casing experiences considered successful. These must be viewed as an ongoing process in capacity-building, otherwise complying with such a long list of complex indicators will not be viable. In that case the SDGs and their respective targets will lose their full force.

Further, there may be a number of institutional barriers that impede the coordination and limit the production of environmental statistics. The SEEA acts as a system which generates environmental accounts and indicators but also promotes and facilitates an institutional coordination among relevant institutional units. As such it is also one of the keys to solving these institutional challenges.

6. Conclusions

In 2015 the world agreed to seventeen universally accepted Sustainable Development Goals with 169 targets. This is an important step forward for the global development agenda, and undoubtedly will be the focus of the international community in the years to come. Among the goals identified is Goal 12, to “ensure Sustainable Consumption and Production (SCP) patterns”.

Monitoring the SDGs, in general, and SCP in particular, will require a set of comparable and robust indicators. This poses important challenges to the international community and nation states in developing appropriate indicators and reporting requirements.

This paper explores some of the challenges in developing the appropriate indicators for sustainable consumption and production, specifically the paper makes the following contributions:

1) Suggests that the only manageable approach to deal with the increased reporting requirements of the SDG targets is identifying a series of available data sets that can underpin key statistical indicators. These indicators must serve multiple targets within the SDGs as an important step in facilitating the monitoring of progress towards them. This will also facilitate the design of a more coherent and integrated set of policies and actions to achieve these goals.

2) Proposes adjustments to the currently proposed indicators stemming from the IAEG-SDGs process, to enhance their statistical basis. This includes the preference for using data that is available now or could be made available without the need for a very large additional investment in data gathering.

3) Proposes that the SEEA framework be the overall statistical accounting framework where the aim is to capture the statistical link between the environment and the economy. The rationale being that it in general it provides multiple long-term advantages in indicator development and reporting efficiencies.

4) It is acknowledged that the statistical areas covering social and economic issues are important to evaluate in the context of SCP and sustainable development.

5) Sets out an initial assessment of capacity-building requirements and proposals related to data collection and application of such indicators. The aim is to be clear on the importance of such activities as part of the overall package measures for achieving the SDGs, and to provide an initial assessment of what is required in that respect.

Implementing the Sustainable Development Goals poses important challenges. These include constructing and producing appropriate indicators that monitor change, which is an essential for ensuring that these goals make a substantive contribution to human wellbeing. To this end indicators following social aspects of poverty, health and equality are vital. Sustainable Consumption and Production is not only an important goal in itself but a cross cutting issue in most of the 17 goals adopted. Carefully designing SCP-related indicators and recognizing the capacity building requirements of countries to implement those indicators is therefore also essential.

The necessary steps forward in a successful implementation of the sustainable development goals, involves recognizing the significant challenges that monitoring the SDGs raise. It requires the identification of headline indicators connected to a broader statistical accounting framework, and also designing and implementing a capacity-building strategy that can support countries in their efforts.

A realistic analysis of the way forward in terms of appropriate indicators and a capacity building strategy to strengthen statistical reporting capacities is essential for the success of both the SDGs and the 2030 Agenda for Sustainable Development. This analysis is also important for advancing towards more sustainable consumption and production patterns.

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Annex 1: Targets of interest to SCP and SEEA

Targets are listed below to which the achievement of more sustainable consumption and production patterns can contribute, or which is an integral part of the achievement of such patterns. These targets are also those for which the SEEA can be used to develop integrated indicators.

1. Target 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
2. Target 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.
3. Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
4. Target 6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
5. Target 6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
6. Target 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix
7. Target 7.3 By 2030, double the global rate of improvement in energy efficiency
8. Target 7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
9. Target 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead
10. Target 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency

and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

11. Target 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
12. Target 12.2 Achieve sustainable management and efficient use of natural resources.
13. Target 12.4 Achieve environmentally sound management of chemicals and all wastes.
14. Target 12.5 Substantially reduce waste generation.
15. Target 12.a Support developing countries to strengthen their scientific and technological capacity.
16. Target 12.b: Develop and implement tools to monitor sustainable development impacts for sustainable tourism.
17. Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
18. Target 14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
19. Target 14.7 By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism
20. Target 14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
21. Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
22. Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

Annex 2 Methodology

This annex is an excerpt from TemaNord 2016:507 *Making the environment count - Nordic accounts and indicators for analysing and integrating environment and economy*

2.1 National accounts: GDP and value added

The general purpose of the national accounts is to provide a systematic statistical framework for summarising and analysing economic events, and wealth of an economy and its components, such as industries and public sectors. The national accounts are described in detail in the System of National Accounts (UN) and the European System of Accounts (Eurostat).

The gross domestic product is a key indicator defined as: an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units (OECD dictionary).

2.2 Energy accounts

The energy accounts belong to the system of environmental accounts (SEEA) main area of physical flow accounts (see SEEA-CF chapter 3). As such they aim at describing the physical flows of energy within the economy and between the natural environment and the economy. The accounting framework is a set of supply and use tables that are based on the expansion of monetary supply and use tables used in the SNA.

There is a conceptual difference between the energy accounts and the energy balances. The simplest explanation is that the energy accounts follow the definitions of national accounts, while the energy balances follow its own guidelines. The most significant difference are that energy accounts are presented according to industries within the economy (by NACE) with the system boundary being resident units, whereas the energy balances are presented according to their own definition of “sectors” within the economy with the system boundary being the national territory.

2.3 Economy-Wide Material Flow Accounts

Economy-wide material flow accounts (EW-MFA) is a statistical/ accounting tool, which is used to describe the physical flows of natural resources, products and waste, etc. in and out of a domestic economy. The EW-MFA reporting to Eurostat describes the extraction of natural resources from the environment (e.g. mining and quarrying) used by the domestic economy and the foreign trade flows between the domestic economy and the rest of the world. The accounts include all types of natural resources, which can be measured by tonnes and all types of products imported and exported. If the material flow accounts also include so-called residuals, i.e. waste, air emissions, etc., and accumulations of materials in the domestic economy, a more complete the picture of the flows to and from the economy to the environment can be developed. When calculating Total Material Flows, all types of natural resources and products, with the exception of water, are included in the accounts. A specific classification, including approximately 60 categories of materials, has been developed by Eurostat for the reporting of the EW-MFA accounts that include resource extraction and trade flows.

Only flows crossing the system boundary (between the environment and the economy) are included in the economy wide material flow accounts. This means that material flows within the economy, for instance flows from one industry to another, are not represented in EW-MFA.

The economy is demarcated by the conventions of the national accounting system (resident units).

2.4 Air emissions accounts

The area covers air pollutants and greenhouse gas emissions.

There are two available data frameworks measuring air emissions. The national emissions *inventories* are calculated according to the so-called territory principle, i.e. the emissions are attributed to the country where the fuel sales occurred and are distributed on technical emission sources.

The air emission *accounts*, however, are prepared according to the residence principle, i.e. the emissions are attributed to the country in which the economic operators causing the emissions are resident, and the emissions are classified according to economic activities (the NACE industry classification).

The statistics on emissions may differ significantly depending on whether the national inventory or air emissions accounts method is used. In Norway and Denmark, international maritime navigation contributes to a large degree to the differences between these two approaches, see the example below in Figure A.1.

In Box 1 the differences in definitions are explained.

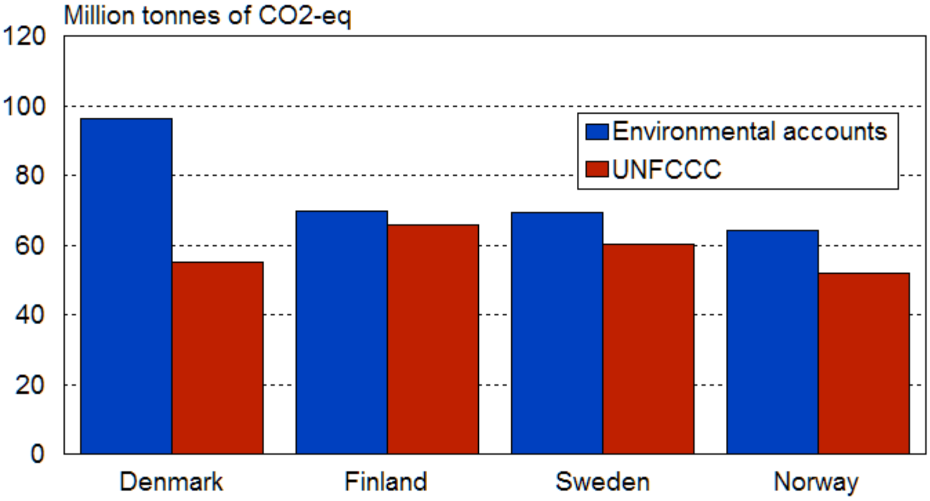
Box 1. Territory versus residence principle

National emissions inventories **Territory principle** **(UNFCCC and CLRTAP)**	**Air emission accounts** **Residence principle**
-The emissions are attributed to the country where the emissions takes place -Emissions are assigned to processes which are classified according to the technical nature -Emissions from international ships and aircrafts are allocated to countries in which the fuel is sold	-The emissions are attributed to the country in which the economic operator is resident -Emissions are classified according to the economic activity following the NACE classification of the system of national accounts -Emissions from international ships and aircrafts are allocated to countries in which the operator of the ship/ aircraft is resident

Source: Eurostat Statistics Explained 2015

Figure A1 visualises the difference between the greenhouse gas emissions as reported to the UNFCCC (national inventories) and to Eurostat via the environmental accounts (air emissions accounts). For all countries, the data reported to Eurostat are always slightly higher than those reported to UNFCCC. This is due to the adjustments for the residence principle for the data under the environmental accounts framework. It basically means that transportation activities carried out by national residents abroad are accounted for within the environmental accounts and they are not included in the reporting to the UNFCCC. The reason for the large difference in Denmark is due to the importance of the shipping industry.

Figure A1. Greenhouse gas emissions in Nordic Countries 2011



2.5 Environmental taxes

Environmental taxes must first of all be classified as taxes in the national accounts (ESA 2010) and consist of compulsory, unrequited payments, in cash or in kind, which are levied by general government or by the institutions of the European Union. They fall within the following ESA 95 categories: taxes on production and imports (D.2), current taxes on income, wealth, etc. (D.5), capital taxes (D.91).

An environmental tax is a tax whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific, negative impact on the environment. (SEEA-CF 2012: §4.150)

Data on environmentally related taxes need, as other data, to be seen in context and interpreted with care. There is, first, the question of whether to include and how to interpret taxes that may have been introduced for other purposes, including not least fiscal motives, and not necessarily as a ”Pigovian” tax on an environmental externality. Many analysts tend to conclude that the effect of taxes, and other economic instruments on behaviour, should be the deciding criterion, and would include taxes motivated by energy policies as well as fiscally motivated duties as ”environmentally related”, as the effect is in practice not dependent on the name or stated motivation for a tax or charge, as long as it has a positive environmental effect.

Indicators for environmentally related taxes are most frequently expressed as a percentage of total tax revenues or total government revenues or as a percentage of Gross Domestic Product (GDP). For international comparisons, these indicators need to be seen in the context of other economic instruments used nationally, such as fees for collection and treatment of waste streams such as for car batteries, tires, packaging, EE-waste and deposit/ refund schemes that are privately administered, following on contractual agreements between environmental authorities and business sectors. Above all, any revenue from auctions of greenhouse gas emission permits may be very important supplementary information to data on carbon or greenhouse gas taxes levied in different countries.

Because of very different economic and energy structures, as well as different tax systems in different countries, evaluation of environmental policies in each country is probably best seen in relation to the trend, rather than just the level, of environmentally related taxes in relation to total revenue or to GDP.

2.6 Environmental goods and services sector

Environmental protection (EP) includes all activities and actions which have as their main purpose the prevention, reduction and elimination of pollution and of any other degradation of the environment. Those activities and actions include all measures taken in order to restore the environment after it has been degraded. Activities which, while beneficial to the environment, primarily satisfy the technical needs or the internal requirements for hygiene or safety and security of an enterprise or other institution are excluded from this definition.

Resource management (RM) includes the preservation, maintenance and enhancement of the stock of natural resources and therefore the safeguarding of those resources against depletion.

The first and most important criterion for a product to be an environmental good or service is that its ‘main purpose’ (the terms ‘prime objective’ or ‘primary purpose’ or ‘end purpose’ are used with the same meaning) is environmental protection or resource management, whereby the main purpose is mainly determined by the technical nature of the product (2009 EGSS handbook, p. 29-31).

2.7 Environmental protection expenditure

Since the 1990s, data on environmental expenditures have been collected by the OECD and Eurostat. In its most recent form, reporting of environmental protection expenditures are covered by EU Regulation 691/2011 consolidated version on European Environmental Economic Accounts.

Data on environmental protection expenditure measure how much an individual company, a government and a households have paid to reduce their own environmental burden, such as expenditures to reduce emissions to air and water or to protect landscape and biodiversity. Some of these measures are taken to comply with environmental policy or laws; some of these measures are taken because the company or the household has identified a specific need through their own environmental concerns.

Data are reported according to the Classification of Environmental Activities part for environmental protection (see Annex 1 of SEEA-CF 2012) and are broken down by aggregated NACE industries, governments and households

The interpretation of data needs to be done carefully. For example: high environmental expenditure as a percentage of Gross Domestic Product (GDP) could be due to a combination of (i) a large backlog of environmental problems, i.e. hot spot that need to be remedied, (ii) ambitious efforts from governments to reach stringent targets, (iii) inefficient and wasteful practices, and (iv) policies which give priority to actions that are easily measured, such as end-of-pipe and clean-up and remediation measures rather than integrated technologies and preventative measures which are more difficult to measure and report. The same factors, in the other direction, could explain low figures. Thorough analysis is needed to clarify which factors are behind both low and high figures.

What is known from the statistics are the actual levels spent on reducing the environmental burden and degradation.

2.8 The NACE classification

Statistical Classification of Economic Activities in the European Community(NACE)

Code	Label
A	Agriculture, forestry and fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage, waste management and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities

Code	Label
M	Professional, scientific and technical activities
N	Administrative and support service activities
O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment and recreation
S	Other service activities
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	Activities of extraterritorial organisations and bodies

Annex 3: Showcasing the indicators

This annex explores and visualises the set of indicators based on statistics and accounts that present a link between the environment and the economy i.e. that are part of the SEEA-framework. Please note that the indicators only show a selection of countries. These indicators have been communicated with the IAEG-SDGs.

In general, the global assessment on SEEA-related data conducted by the UNSD in 2014 showed that the indicators presented below in this annex are the most common areas within the SEEA to be published (UNSD 2015). Areas such as air emissions- and material flow accounts, environmental taxes and environmental protection expenditures are available throughout, (but not exclusively) the EU28 countries, EFTA-region, the Balkan region, Australia, Brazil and Canada. In these fields the OECD and Eurostat are also publishing these data. UNEP is also publishing data on material flow accounts.

Noticeable among many statistical agencies is the increasing interest from policy makers, especially since the SEEA-CF was adopted as a global statistical standard. The statistical offices in the Nordic countries as well as Canada, the Netherlands and Italy among others participate in capacity building activities in the field of SEEA. Through these activities the main interest has been on the topics covered by the SEEA-CF, i.e. air emissions, material flows, energy accounts and environmental protection activities and transfers.

A) Tracking changes in production patterns – pollution and the economy

This section discusses and describes indicators that have the potential to inform Goal 12 “ensuring sustainable consumption and production patterns”. However, the information also meets some of the information needs of goals 2 (food), 3 (health), 6 (water), 7 (energy), 8 (economic growth), 9 (environmentally sound technologies), 11 (cities), 13 (climate) and possibly also 14 (marine environment) and 15 (terrestrial and freshwater environment).

1. Greenhouse gas emissions

Statistics on greenhouse gas emissions[20] can be used as the basis of indicators to inform the following targets: 8.4, 9.4, 12.2 and possibly 13.1[21]

Greenhouse gas emissions are the drivers of climate change. By monitoring the trends of emissions that drive climate change the exposure and vulnerability of climate related extreme events can be anticipated. If the trends show a decline, the exposure will be less dramatic and the resilience strengthened. The decoupling of economic growth from environmental degradation, in this case climate change, is measured through the link between greenhouse gas emissions and the gross domestic product. It then relates to the question of changes in the production processes to be able to produce the same or similar goods or services but without or with less impact on the climate.

By monitoring the greenhouse gases emitted by the industry or the service industry in one country enables a follow-up if the upgrade of infrastructure and retrofitting the industries are successful. The indicator provides evidence on who is changing and of where it does not progress in a satisfactory manner.

There are different ways to present greenhouse gas emissions when considering an indicator. For example, they can be presented in terms of total emissions or per capita emissions. In figure 6.1, greenhouse gas emissions are shown in relation to Gross Domestic Product (GDP). This indicator gives a notion of environmental efficiency since it relates the emissions caused through production with economic output.

In the case of France, for example, the driver of the emission intensity can be shown using SEEA data. In France emissions intensity have been decreasing substantially over time, albeit in large part due to the high nuclear power dependency of their electricity system, suggesting additional information may be necessary to complement indicators, in order to have a full picture of sustainable production patterns Figure 1 shows that in France, the greenhouse gas intensities are the highest for the agriculture, forestry and fishery industry, indicating high levels of emissions per value added.

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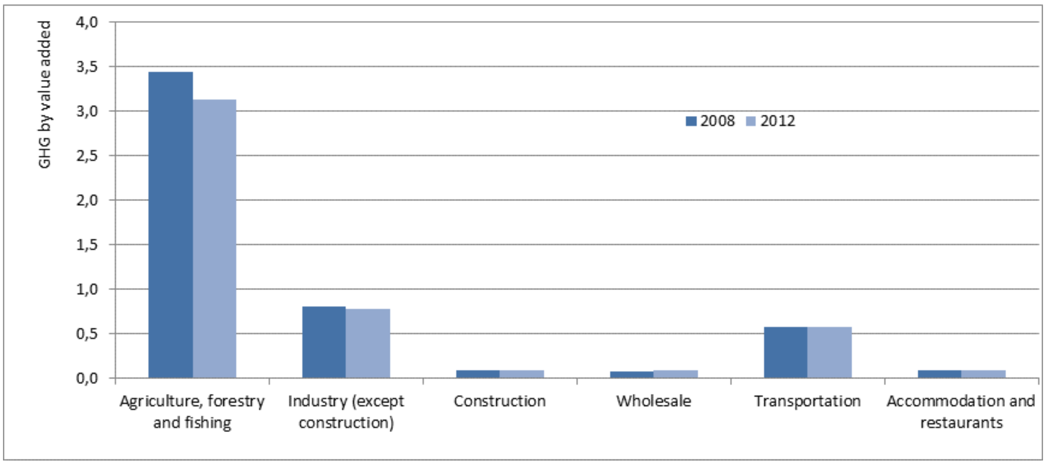
[20] A combination of air emissions from carbon dioxide (CO_2), methane (CH_4) nitrous oxide (N_2O), and fluorinated gases (CFCs) which are calculated into CO_2 equivalents.
21 See Annex 1 for definitions

Figure 1 Emission intensities by industry in France. Tonnes of GHG-emissions by Million Euro, NACE



Note: Value added in chain liked volumes, reference year 2005. Industry consists of NACE B-E
Data source: Eurostat, environmental and national accounts

Data source

It is important to be clear about these differences in order to be able to achieve statistical reconciliation from various data sources. The indicator in figure 1 for France is constructed using data from Eurostat and is consistent with SEEA.

2. Air emissions, particulate matter

Particulate matter air emission can be used as the basis of indicators to inform targets 12.2, 11.2, 11.5, 11.6[22]. Exposure to particulate matter is a major cause of health problems for people as it is capable of penetrating deep into the respiratory tract and causing severe tissue damage. The origin of emissions of particles is from road abrasion, and burning of fossil and bio fuels as well as from forest and grassland fires. An important source of particles comes from motor vehicles.

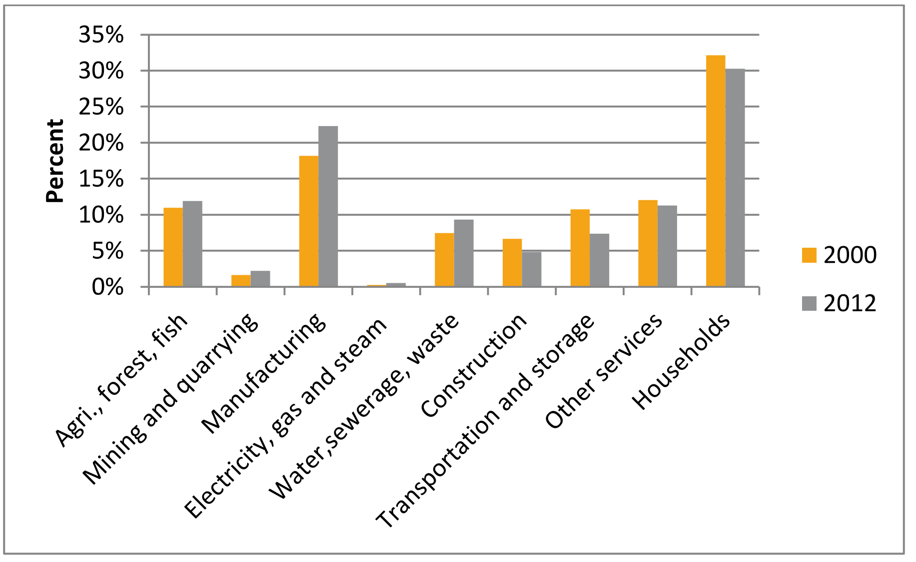
Exposure is calculated by weighting mean annual concentrations of PM2.5 (the smaller particles) by population in both urban and rural areas. The World Health Organisation (WHO 2006) provides the guideline that the emissions of $PM_{2.5}$ should not exceed 10 µg/ m3 annual mean.

In the case of Switzerland, in 2012, $PM_{2,5}$ emissions were estimated at around 9 thousand tonnes. Between 2000 and 2013 the emissions of

[22] See Annex for definitions of targets

$PM_{2.5}$ have declined by about 22 percent. Figure 2 shows that the households are contributing the majority of annual $PM_{2.5}$ emissions, followed by the manufacturing industry.

Figure 2 Particulate matters, $PM_{2.5}$ emissions by industry-Switzerland, NACE and households



Data source: Eurostat, environmental accounts

Data source

To calculate the exposure to the population, the concentration in air is needed as data input. This is a state of the environment statistics that is not included in the SEEA framework. In the SEEA the emissions from various sources can be calculated, but the resulting concentration needs to be measured in situ, as it depends on local conditions.[23]

The indicator in figure 6.4 for Switzerland is constructed using data from Eurostat and is consistent with SEEA.

3. Water emissions

23 Population-weighted exposure to ambient $PM_{2.5}$ pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter.

Water emissions can be used as the basis of indicators to inform the following targets: 12.2, 6.3, 2.4, and 14.1[24]. Point source emissions of pollutants and heavy metals from manufacturing industries and waste water treatment plants impact water quality, the quality of agricultural products and biodiversity. However, in some countries, such as Sweden, the largest source of emissions of nitrogen and phosphorous comes from diffuse sources such as forest land, agriculture land, private waste water wells and run-offs (SCB 2013).

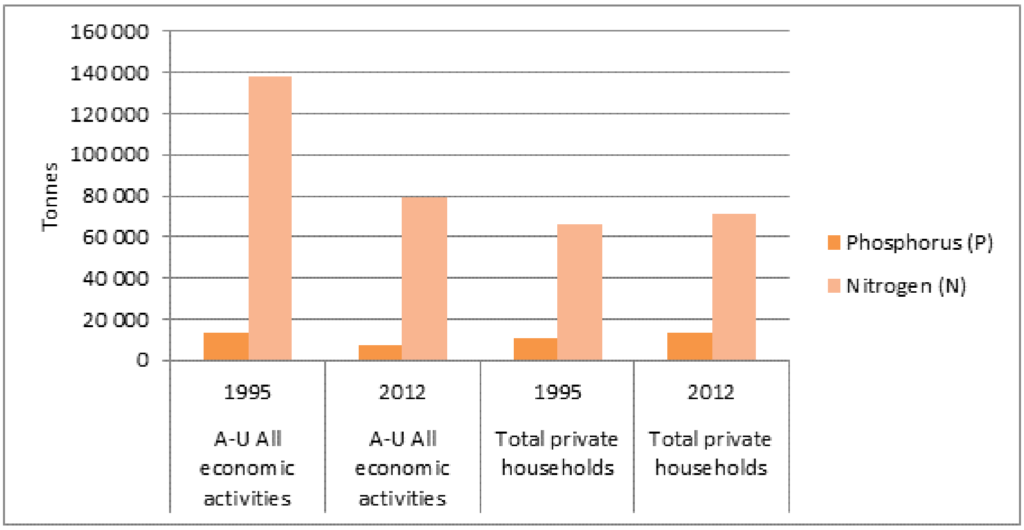
Measuring emissions to water, therefore, is not straightforward as there are many substances emitted and modelling of the national total emissions is needed. Emissions to water bodies are reported to various environmental conventions such as HELCOM and OSPAR.

In Europe, the European Environmental Agency is storing data from some European countries on different pollutants. The register called Pollutant Release and Transfer Register (PRTR) holds information on hazardous chemical substances and/ or pollutants released to air, water and soil by a number of named companies. However, it is not yet ready to be used for international comparisons due to quality issues and reporting methods. This is an area in which significant capacity building improvements may be necessary.

Netherlands presents an example, in 2012, reactive nitrogen released to water bodies by businesses fell from 79,000 to 138 000 tonnes in 1995. However, between the same years household emissions increased (see figure 3)

[24] See Annex for definitions of targets

Figure 3 Changes in emissions to water of Phosphorous and Nitrogen, 1995 and 2012 by households and producers in the Netherlands, tonnes.



Source: Statistics Netherlands 2016

Data source

Unfortunately no international or global database was found that could be used as an example here. There are registers available, but they clearly say that the data should not be used for comparisons between countries due to low quality in reporting standards[25].

Even at national level it was difficult to find data on water emissions. But Statistics Netherlands (Centraal Bureau voor de Statistiek) biannually compiles water emission accounts. The data for these accounts are derived from the Dutch National emission inventory. Emission sources include both point sources and diffuse sources.

4. Use of hazardous chemical products

This indicator has the potential to monitor target 12.2, 12.4, and 3.9[26].

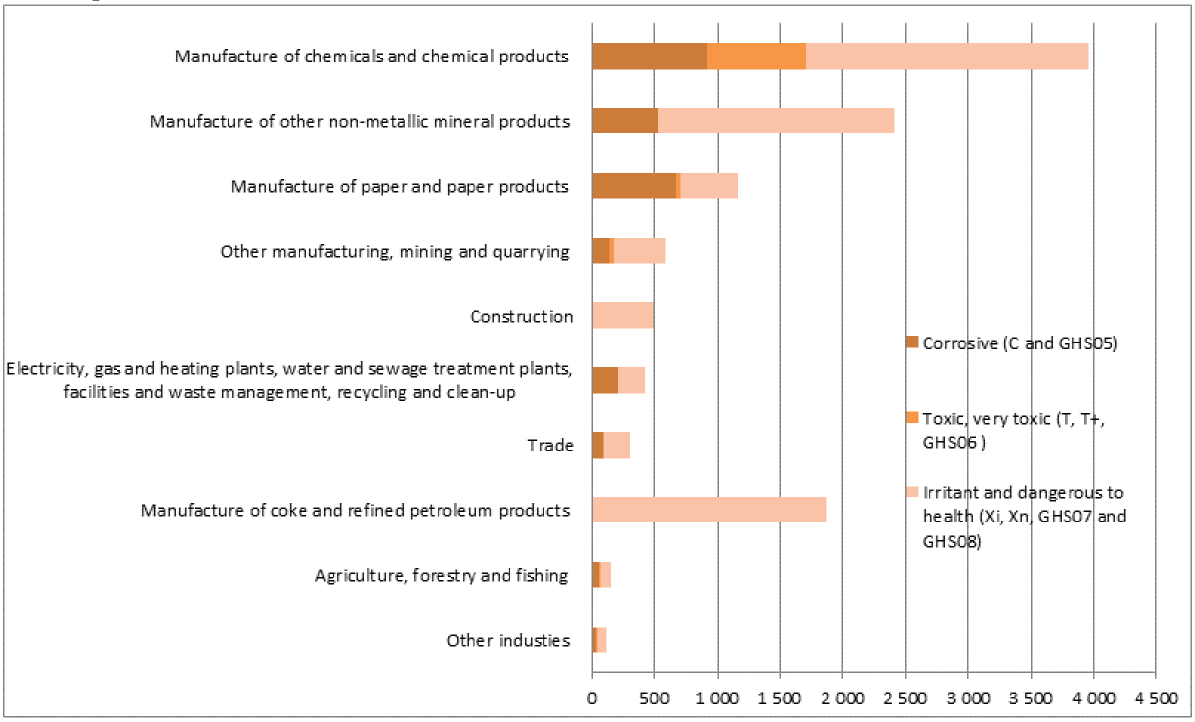
Chemicals are a very broad category of products. Even water and gold belong to the group called chemicals, as well as petrol, diesel and detergents. However, it is the chemicals known to have particular hazardous properties that are of concern in manufacturing, in consumption and in disposal. Risk reduction in products is complex as chemical compositions change over time and

[25] One such example came from the PRTR register.
[26] See the annex for definition of targets

in connection to other compounds (KemI, 2011). The productions of toxic chemicals in Europe are declining, by 14 percent between 2004 and 2013 (Eurostat, 2015).

In Sweden, the use of hazardous chemicals to health are increasing steadily. During the same time period, 2004-2013, the increase was just below 20 percent (SCB 2015). The industries producing the chemicals are, together with the industries manufacturing other non-metallic mineral products (i.e. glass, cement etc.) and coke and refined petroleum products, the largest users of chemical products. Some of these products are not commonly reaching consumers, but goods such as petrol, diesel, detergents, paper, computers, and textiles do. In 2013, in Sweden, of the total chemicals used around 18 percent are hazardous chemicals and emitted by the service sector, including the provision of food, textiles, pharmaceuticals and paper products, and services and goods offered by hotels and restaurants.

Figure 4 Use of chemical products classified as hazardous to health, by category, aggregated industries (NACE), 2013 [thousand tonnes]



Source: Statistics Sweden 2015

Data sources

At the international level it is often difficult to find statistics on the quantities of hazardous chemical use, as the focus is often on risk and properties for risk assessments rather than on the use itself. Sweden has a register for this type of information with some information on the industries that use the chemical products, making it possible to use the data in the SEEA. The other Nordic countries have similar systems. Chemical indicators in earlier sustainable development indicator sets have often focused on individual health and environmental problems, such as that of PCB use and its connection to bird death.

The Swedish Chemicals Agency is the custodian of the so called Product Register where chemical products are registered and from which time series are available from 1992. The primary purpose of the register is to allow the supervision of importing and manufacturing companies, for monitoring of national policy and for local authorities. The register contains information on chemicals used and their quantities.

The indicators that are published at Statistics Sweden measure the quantities of products classified as dangerous to the health and are environmentally dangerous according to international criteria. The standard classification of industries are also used (NACE).

B) Tracking changes in production patterns – natural resources and the economy

This section examines and describes four indicators which have the ability to track changes in the use of natural resources and its links to economic activities and households.

The chosen indicators have the potential to inform SDG targets such as 12 (SCP), 6 (water), 7 (energy), 8 (economic growth) and 11 (cities). Please note that the indicators show a few country examples.

1. Hazardous waste

Amount of hazardous waste generated can be the basis of an indicator that can inform the following targets: 11.6, 12.2, 3.9, and 12.5[27].

Waste is more and more becoming to be seen as a resource that is not used to its full potential. In the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (http://www.basel.int/), 164 countries agreed to minimize the generation of hazardous waste, to assure sound management of hazardous wastes, to control transboundary movement of hazardous wastes; and to improve institutional and technical capabilities especially for developing countries and countries with economies in transition. At later meetings, Parties agreed to a ban on the export of hazardous wastes from OECD to non-OECD countries ('Basel ban').

Hazardous waste is waste that owing to its toxic, infectious, radioactive or flammable properties poses an actual or potential hazard to the health of humans, other living organisms, or the environment. Hazardous waste here refers to categories of waste to be controlled according to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Article 1 and Annex I). If data are not available according to the Basel Convention, amounts can be given according to national definitions.

The statistics monitoring the generation of hazardous, as well as general, waste show large differences between countries. A possible explanation is that the waste management is organized differently in different countries and that there are different ways of measuring

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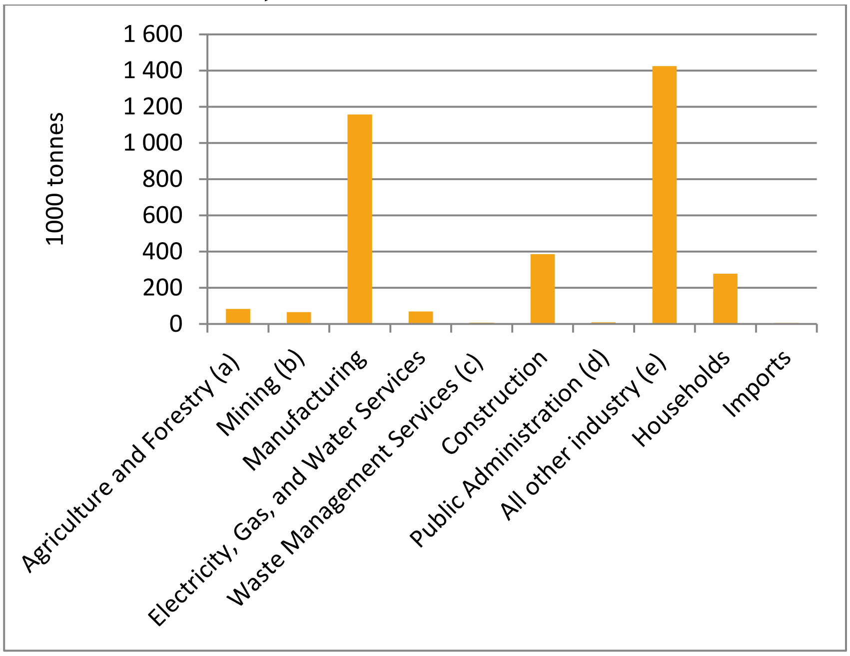
[27] See annex for target definitions.

and monitoring waste flows. Waste statistics are, however, being reported to international institutions such as Eurostat and the UNSD.

Australia provides an example for indicators on the generation of hazardous waste an example can be given by Australia. Following the SEEA classification it is possible to distinguish who is generating hazardous waste, in the case of Australia, manufacturing plays a significant role accounting for over 33 percent of total waste generated. But it is the service sectors, such as trade, transport, hotels and restaurants that accounts for the highest share, 41.

Figure 5 Hazardous waste generated by industry, government and households 2009-10, Australia



Excludes Fishing, (b) Excludes mineral waste, (c) Includes Waste Collection, Treatment and Disposal Services (ANZSIC Division D, subdivision 29), (d) Local Government Authorities, (e) Includes ANZSIC Divisions F-S, excluding subdivision 75
Source: ABS 2014, Cat.No 4602.0.55.006

Data sources

The UNSD in cooperation with UNEP collects data on waste from official statistics supplied by national statistical offices and/ or ministries of environment (or equivalent institutions). The data collection is a biennial and is complemented with comparable statistics from OECD and Eurostat.

The methodology applied at the ABS when constructing the waste accounts follows the SEEA. The physical supply table records the total supply of solid waste products within the economy (including imports). The physical use table records the total use of solid waste materials within the economy (including exports). The main data source for the compilation stems from the Waste Generation and Resource Recovery in Australia. The ABS uses the SEEA to transform this data into a framework to enable linkages between waste supply, waste use and the various economic aggregates, such as e.g. value added of the manufacturing, construction and services contained in the Australian National Accounts (ABS 2014).

2. Domestic Material Consumption (DMC)

Domestic Material Consumption can be the basis of indicators to monitor the following targets: 12.2 and 8.4[28].

To decouple economic growth natural resources use it is important to reduce the depletion of materials such as fossil fuels, minerals and metals. Not all materials have a negative impact on the environment some very important materials such as fossil fuels have devastating effects. Measuring how much metals, minerals and biomass enter the economy is done through statistics called Economy-Wide Material Flow Accounts.

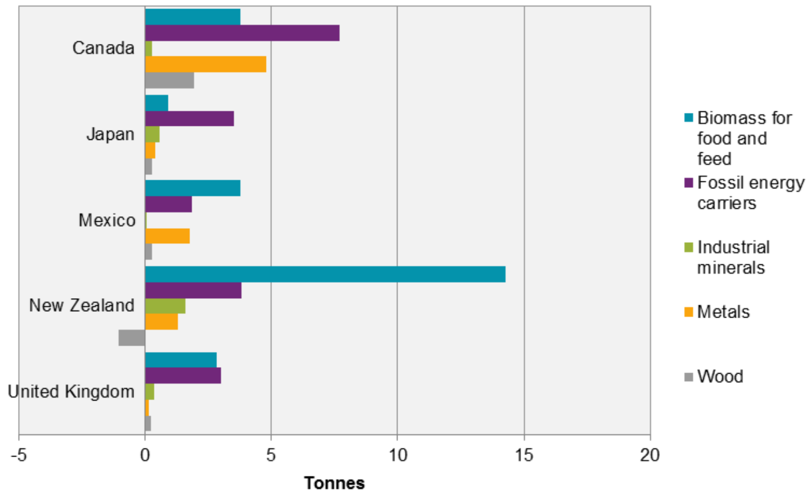
Domestic material consumption (DMC) is an indicator from this framework that measures the total amount of materials (in tonnes) used by an economy. It is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports and minus all physical exports.

This indicator provides an assessment of the absolute level of the use of resources, how much is driven by domestic demand and the export market. DMC does not include upstream 'hidden' flows related to imports and exports of raw materials and products.

The statistics reflect the national circumstance of access to natural resources. Figure 6 show domestic material consumption per capita and how in particular New Zealand consume biomass for food and feed, much higher than Canada, Japan, Mexico or UK. This is due to the composition of biomass in New Zealand compared to that of the selected countries.

[28] See annex for target definitions

Figure 6 Domestic material consumption per capita and material category, 2010, tonnes (excluding construction minerals)



Data source: OECD

Similarly, Canada shows the highest domestic material consumption per capita of fossil energy carriers out of the selected countries. This is mainly due to the national circumstance of Canada as an energy producer. In addition, coal is still a primary source used nationally for electric power generation.

Data sources

Statistics on Economy-wide material flow accounts (EW-MFA) has been developed since the mid-2000s by international organisations and national experts. Guidelines and studies on how to compile the EW-MFA are available through the UNSD and Eurostat web-sites, with the SEEA central framework outlines the area and provides assistance on where to look for further information.

Currently Eurostat and the OECD are collecting and disseminating data on this type of statistics from countries, mostly from national statistical offices around the world. UNEP also publishes data on material flows based on research data.

3. Energy use

Fossil energy use intensities can be the basis of an indicator that can inform the following targets: 7.2, 7.3, 8.4 and 12.2[29].

Energy production, use of fuel in transportation and in production processes has consequences from a sustainability perspective

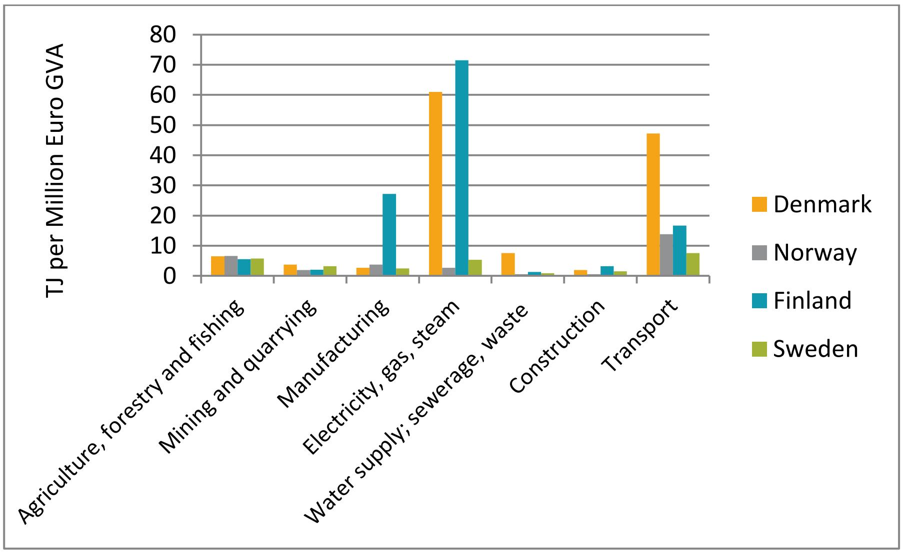
[29] See Annex for target definitions

irrespective of the energy source. These include air pollution and climate change, water pollution, solid waste problems and impacts on landscape and biodiversity. It also impacts on society if prices are an obstacle for access to energy for the population.

The indicator does not provide information about accessibility, nor does it provide an indication of prices. Other energy and price related indicators are required to measure that, such as the number of people connected to energy grids and electricity prices for household consumers.

Figure 7 show the fossil fuel intensity (Tera Joule by gross value added) in the Nordic countries Denmark, Finland, Norway and Sweden by industry (NACE).What the figure shows is that the manufacturing industry in Finland, compared to the other Nordic countries, is relying heavily on fossil fuels. Also noticeable is the high intensity of fossil fuel use by gross value added in the electricity, gas and steam industry in Denmark and Finland compared to Norway and Sweden. The latter two countries have access to hydroelectric power which neither Denmark nor Finland has.

Figure 7 Fossil energy fuel use intensity, TJ per million Euro gross value added, the Nordic countries (Denmark, Finland, Norway and Sweden), 2012 (Finland 2011)



Note: services are not included in the figure due to very low intensities. Household use of fossil fuels is also not included in the figure as it cannot be linked to the economic indicator GVA.

Source: Statistical offices of Denmark, Finland, Norway and Sweden

Data source

The indicator of energy use per capita is widely accessible for many countries as the International Energy Agency and the World Bank has for many years collected the data. This data is based on the national territory principle and it is not recommended to link this data to economic statistics in any detail. One such example is to calculate the energy intensities. The sectorial aggregates from the energy balances differ from e.g. industry aggregates of which value added, or other monetary data are based on. The easiest example is the sector “transport” in the energy balances include all energy used by all vehicles (function of the energy use). The industry “transport” in the ISIC classification only relate to energy used by those companies performing the services of transportation (the energy used by this particular economic activity).

The second indicator, fossil energy fuel use intensities by industry is derived from organising the data in accordance with SEEA, i.e. by industry classification like the ISIC. There are only a few countries publishing energy accounts (i.e. the supply of and the use of energy products, residuals and nature by industry), like e.g. Australia, Canada and a few European countries, but there are many countries conducting pilot studies at the moment. Currently Eurostat is preparing to collect data on physical energy flow accounts in line with the new EU regulation on environmental accounts. The first data transmission is expected in 2017. Until then Eurostat collects the data on a voluntary basis.

4. Water use

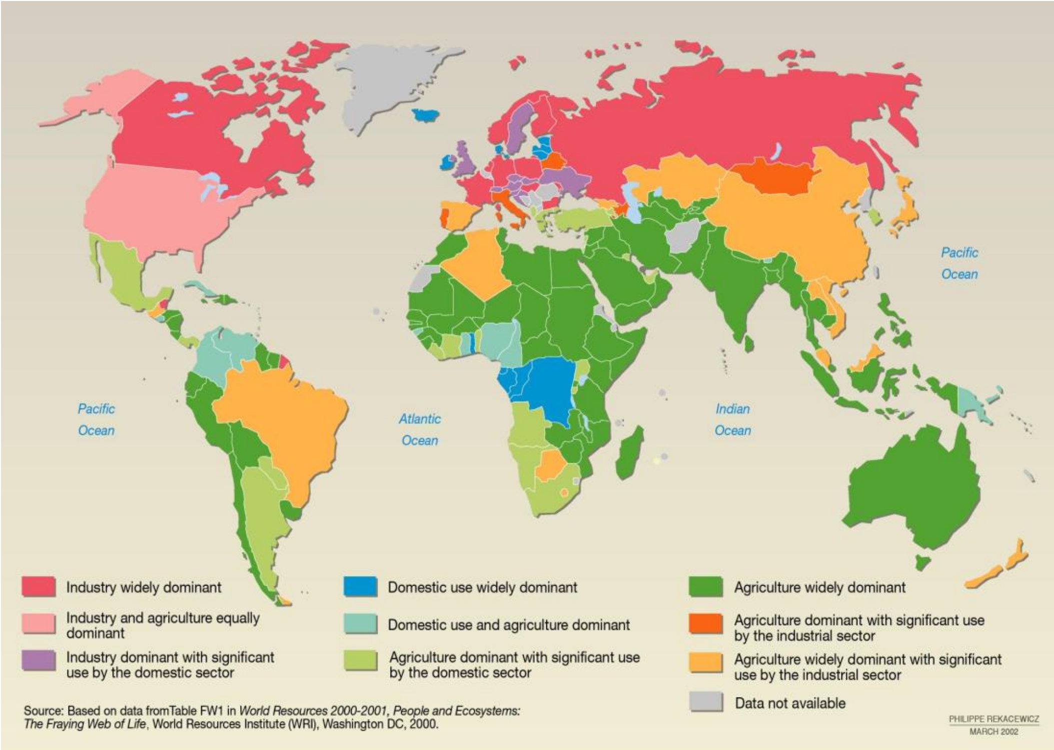
Water use can be the basis of indicators to inform the following targets: 6.4, 12.2, and 13.1[30].

By monitoring water use across sectors, it is possible to identify heavy water users and where efficiency measures must be applied, if water shortage is an issue nationally.

Moving towards the link between the economy and water use it is important to know more about who is using the water as noted above. Figure 8 shows, albeit not a fully aligned with SEEA, a world map of fresh water use per dominant sector. From this it can be seen that regions such as Europe, Russia, China and North America generally have industry using most water, while in Australia, Africa and South America the agricultural sector uses the most.

Figure 8 World map of fresh water use per dominant sector

[30] See annex for targets



Source: World Resource Institute and UNEP

Data source

On the topic of water use, several international organisations are involved in collecting data. FAO collects data and publishes it in their database Aqua-Stat. The UNSD-UNEP, and the OECD and Eurostat Questionnaires have through collaboration developed a reporting tool for both developing and developed countries, where the data are published on the respective organisations web-sites. For these questionnaires, water use data is collected by ISIC.

However, the issue of collecting and reporting water statistics is dependent on national policy in relation to water. In countries were water is abundant intermittent surveys are conducted, for example every second, third or even fifth year (as the case is in Sweden). In countries where water shortage is a problem measuring and monitoring of water use is higher on the policy agenda.

Measuring water use is complex and requires multiple data collection tools, such as surveys, administrative records and models.

C) Tracking changes of environmental technologies

The two indicators presented below aim at measuring changes in applying environmental technologies and achieving more efficient and sustainable natural resource management.

The chosen indicators have the potential to inform SDG targets such as goal 3 (Health and wellbeing), 6 (water), 7 (energy), 8 (economy), 9 (industry, innovation and infrastructure), 12 (SCP), 13 (climate), 15 (Life on land). The two indicators span many targets as they are covering all environmental areas and also areas such as energy efficiency and natural resource management more broadly.

1. Environmental protection expenditures

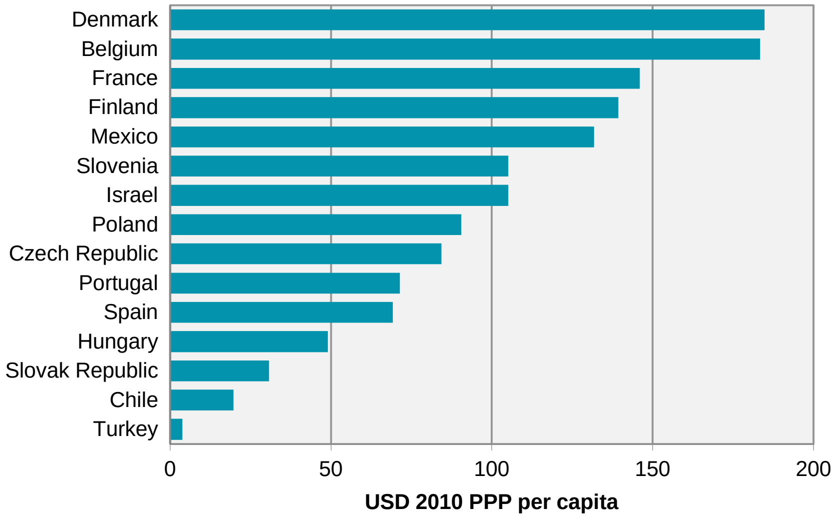
Environmental protection expenditures can be the basis of indicators that can inform the following targets: 3.9, 6.3, 9.4, 12.2, 13.1, and 15.1[31].

This is a truly cross-sectorial indicator in terms of the sustainable development goals. Monitoring how much has been spent on environmental protection and within what area is an indication of where there are hotspots and to a certain extent where there is access to appropriate technologies. Many targets within the SDGs depend on technologies that will be necessary to reduce current pollution levels and more effectively and efficiently manage waste.

Figure 9 shows how much was spent on environmental protection by the public sector per capita for a selection of countries on.

[31] See Annex for target definitions

Figure 9 Environmental protection expenditures in public sector, 2012, USD per capita



Source: OECD

Data source

This set of statistics measures how much the public sector (government) has spent on reducing environmental pressures such as pollution to water, air, waste or biodiversity. The SEEA provides the framework for the statistics and it has been collected by Eurostat and the OECD as a joint reporting initiative since the 1990s.

2. Value added in environmental goods and services sector

Value added in environmental goods and service sector can be the basis of indicators that can inform the following targets: 3.9, 6.3, 6.4, 7.2, 7.3, 9.4, 12.2, 12.b, 13.1, 15.1, and 15.2[32]

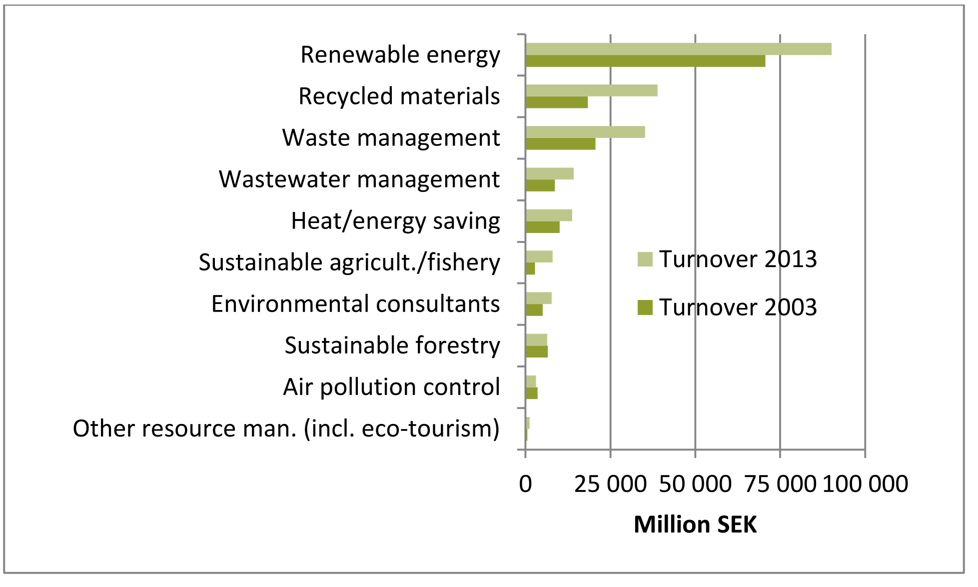
This indicator has the potential to inform a large set of targets within the SDGs since it measures those companies that produce goods and services aimed at the reduction and elimination of pollution and the more efficient and less polluting use of natural resources. It can be specific technologies and equipment to minimise water pollution, or consultants providing expertise and knowledge in energy efficiency measures. The statistics follow the economic development of these activities and include the aspect of green jobs and export potentials of environmental goods and services which are also important aspects of reaching targets of the SDGs.

[32] See annex for target definitions

Figure 10 show an example from Sweden. Over the past ten years the environmental goods and services sector has grown in Sweden, by just below 50 percent. It is mainly seen in renewable energy production (businesses that provide renewable energy and the technology) as well as within recycled materials. Other sectors, such as eco-tourism have not grown particularly over these past years, nor are they a large contributor to the Swedish economy.

This indicates that the businesses in Sweden create opportunities to move towards increasing the share of renewable energy in the energy mix. They also increase the provision of waste management to minimize the risk of pollution reaching the environment and the population. They also increase the provision of goods and services for efficient use of natural resources.

Figure 10 Turnover in the environmental goods and services sector, by domain, 2003 and 2013, Million SEK



Data source: Statistics Sweden

Data source

Statistics for environmental goods and services statistics is currently still under development. It is mostly produced in Europe and a few other OECD countries. However, interest in green business opportunities and creation of green jobs will increase demand for these data. EGSS statistics include production value, added value, employment and exports. The statistics can be allocated to industries and specific environmental domains (e.g. waste management, renewable energy).

Different types of indicators can be formed by combining EGSS with other macroeconomic indicators e.g. percentage of EGSS in GDP, share of employed in EGSS in relation to total employment. Also, production value or exports can be considered in relation to population size and presented on a country level.

D) Tracking changes in consumption patterns

This section outlines two indicators that has the potential to follow goal 8 (economy), goal 12 (SCP) and goal 13 (climate change) from a consumption perspective. Tracking changes in consumption patterns linked to environmental pressures and impacts are not common today within national statistical offices, it is rather research based data that are available.

1. Environmental pressure from consumption – materials

Environmental pressures from consumption-materials can be the basis of indicators that inform the following targets: 8.4 and 12.2[33],

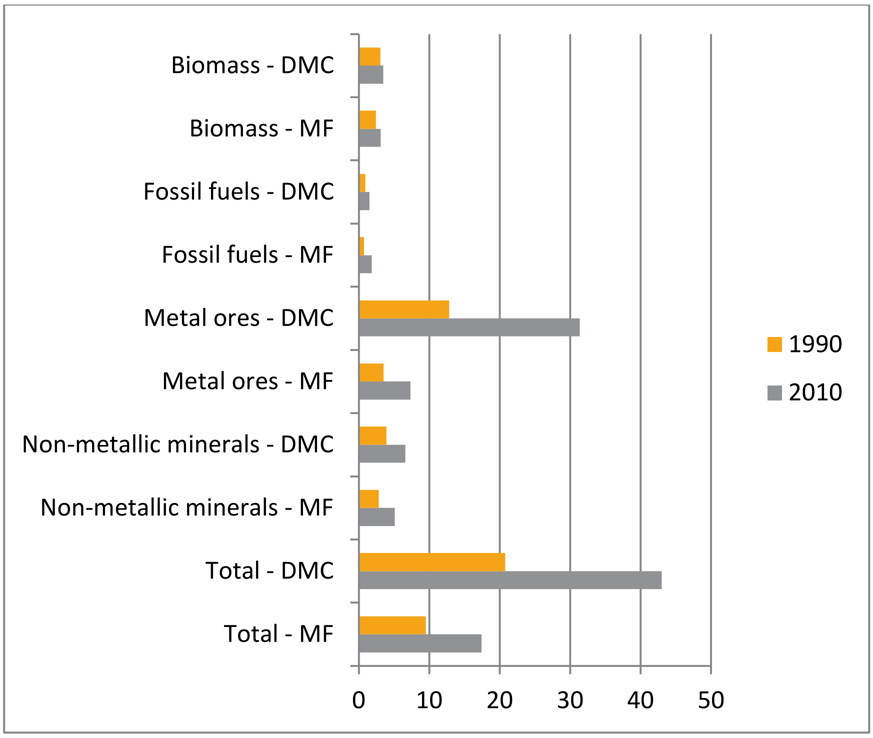
Tracking natural resources are essential to the understanding of the amount used, recycled and scrapped. It is also important to know what types of natural resources are in high demand, which ones are renewables and those that are non-renewable. Becoming better at managing our natural resources are essential in providing a sustainable future.

Material footprint provides insight on how much one country depends on materials that have been extracted in another country.

Chile has a higher Domestic Material Consumption compared to the Material footprint. This indicates that Chile is mostly using domestic materials in their economy and are not relying extensively on materials from abroad. The DMC has increased over a 100 percent the 10 years shown in the figure. This can be attributed to an increase in DMC for metal ores.

[33] See annex for target definitions

Figure 11: Comparison of Material Footprint to Domestic Material Consumption per capita in Chile, 1990 and 2010



Source: UNEP Live

Data sources

These types of data are most commonly produced by research institutes. In this case, UNEP Live are publishing data produced by CSIRO.

2. Environmental pressure from consumption – GHG

Environmental pressures from consumption-GHG can be the basis of indicators that inform the following targets: 8.4, 12.2, and, 13.1[34]

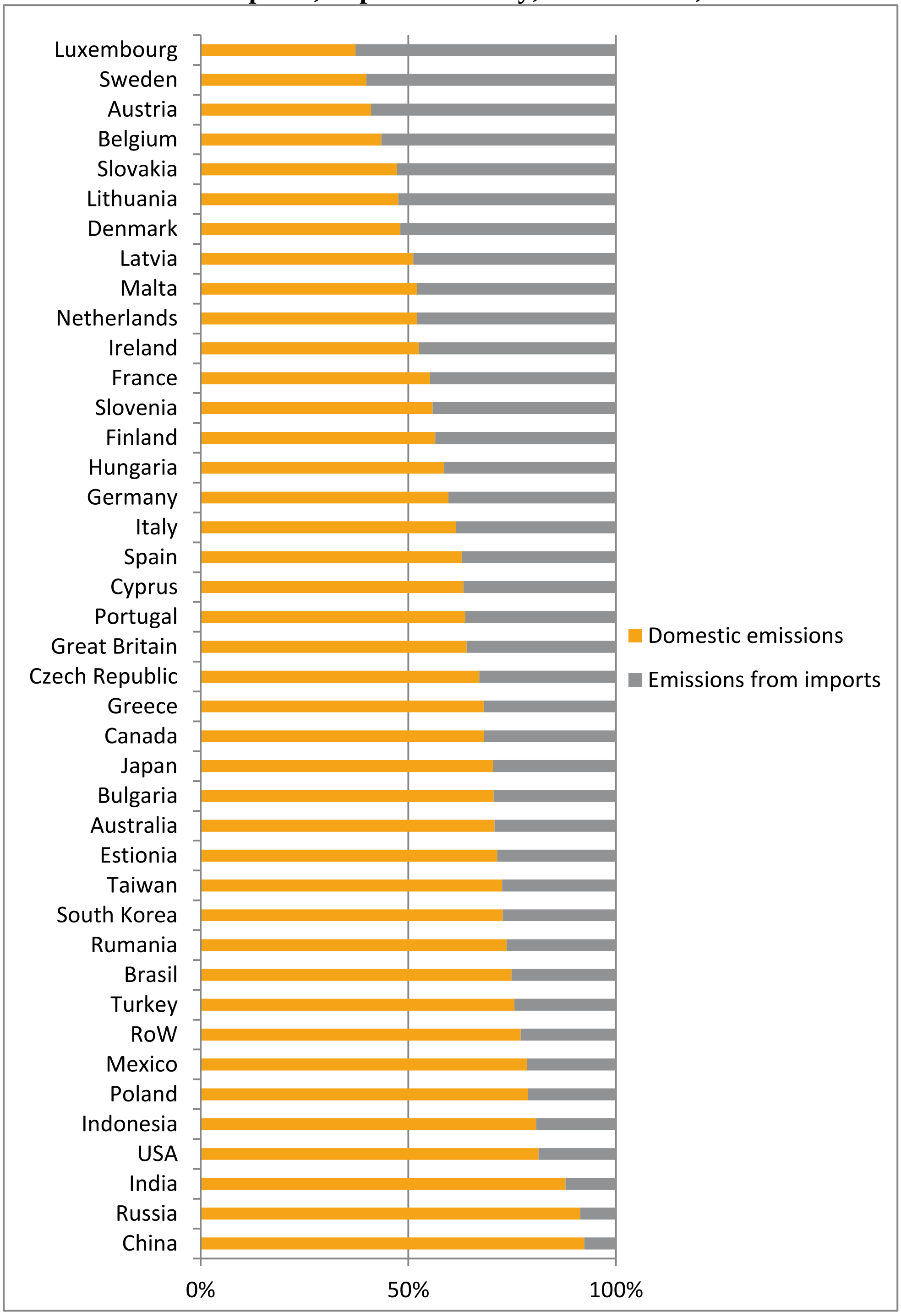
In addition to knowing who is producing the greenhouse gas emissions in one economy, or one country it is also beneficial to know and follow the structure of the emissions in terms of final demand. By this it is meant that some emissions can be linked to those products and services purchased by households, others to government, non-profit organisations and also other variables such as gross fixed capital formation and inventories, included in the concept of final consumption. In this way, both the emissions generated

[34] See annex for target definitions

directly from the use of a particular product or service and the indirect emissions from earlier stages of the production process can be considered.

Figure 12 show an example from Sweden, using data from an international database called WIOD, CO2 emissions from Swedish final consumption can be compared to corresponding trends in other countries. Compared to other countries, a relatively large proportion of total Swedish CO2 emissions come from import activities. Only one country in the data, Luxembourg, generated a larger proportion of emissions per capita from imports than Sweden in 2009. During the period 1995-2009, however, a relatively large reduction in Swedish domestic CO2 emissions linked to final consumption occurred, compared to the vast majority of countries studied. Countries that contributed to increased CO2 emissions during the period were mainly to be found in Asia and Oceania.

Figure 12 Percentage distribution of CO2 emissions per capita from domestic consumption, per country, in 2009, ranked



Source: SCB 2014 and WIOD

Data source

Today several global research databases exist that provide calculations on greenhouse gas emissions from final demand. The base model comes from the national accounts, and is called Input-Output tables. There is no international organisation that collects the data directly from statistical offices, or other national authorities.

However, some national statistical offices do calculate these types of indicators e.g. Germany, Canada, Sweden and Australia.

E) Tracking changes effected by environmental economic instruments

Environmentally related taxes and subsidies show the importance in tracking environmental economic instruments such as subsidies and environmental taxes. As environmental-economic instruments these two indicators are two of only a few tools available governments to steer consumption and production patterns.

1. Environmentally related subsidies

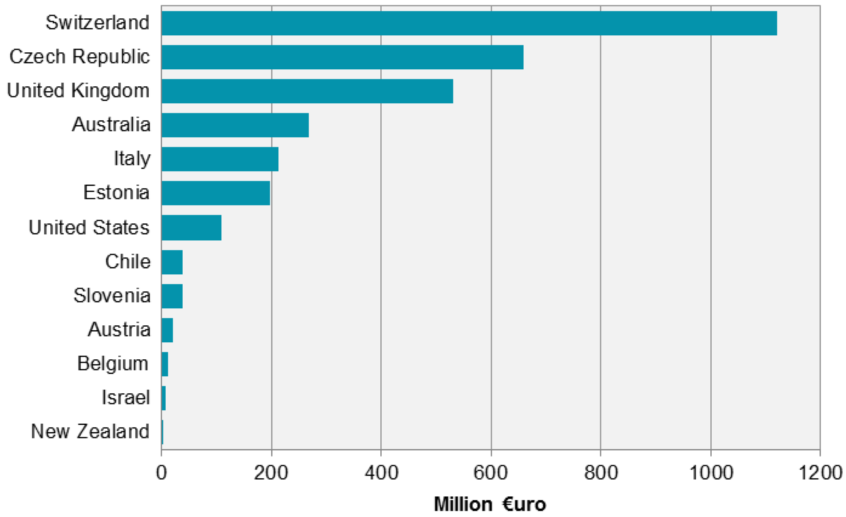
Environmentally related subsidies can be used as the basis of indicators to inform the following targets: 6.a, 7.2, 7.3, 7.a, 9.4, 12.2, 12.a, 13.1, 14.7, 14.a, 15.a and, 15.1[35]

This indicator touches upon several SDG targets. As the statistical product measuring environmentally related subsidies cover all government outlays that are either subsidies, investment grants or social transfers in kind, it provides an overall picture of national assistance to production and consumption.

The specific indicator shown in figure 13 would not meet the needs of all the proposed targets above. However, digging deeper into the national data sets, details showing the function of the payment (has it been used for energy efficiency research, liming of lakes or improving biodiversity) and to whom the subsidy, investment grant or similar transfers have gone to would monitor the SDGs.

[35] See annex for target definitions

Figure 13 Environmental motivated subsidies per country, 2010



Source: OECD, Database of economic incentives for environmental policy

Data source

Environmental subsidy statistics can be formed from the government financial results. Methodological work is being developed by Eurostat on how to measure such statistics in a standardised format that enables harmonisation across those using the manual[36]. Eurostat has also started a pilot questionnaire to see how many European countries have the ability to report the data. In the context of SEEA CF the area is also still under development. OECD currently collects environmental subsidy data in an open database of economic incentives for environmental policy. This database is populated by government ministries, some statistical offices or the OECD themselves.

2. Environmental taxes

Environmentally taxes can be used as the basis of indicators to inform the following targets: 12.2, 13.1[37],

Monitoring the trend and development of environmental tax revenues provides insight to which steps a government is taking in order to change the current situation. With taxation systems it is possible to nudge production and consumption patterns through pricing.

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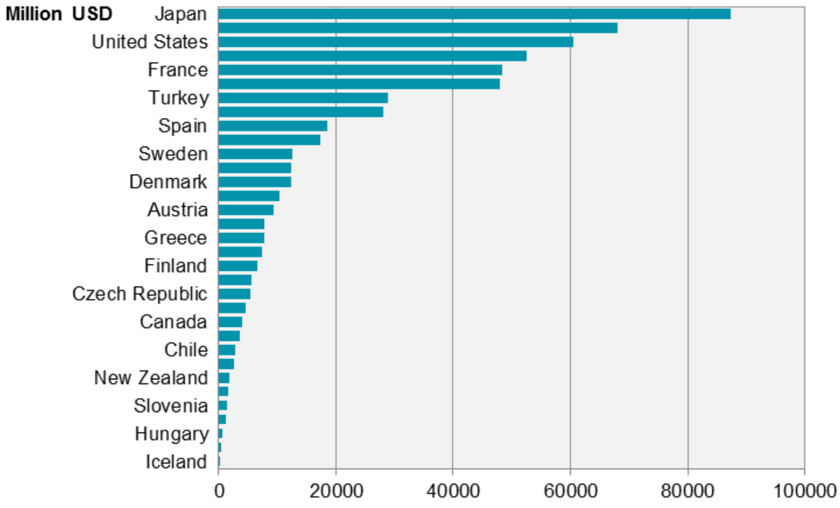
[36] Eurostat 2015: Environmental subsidies and similar transfers — Guidelines
[37] See annex for target definitions

Figure 14 show that in terms of revenues from environmental taxes, Japan, followed by the United States and France collects the highest revenues.

Figure 14 Environmental tax revenue, excluding charges and fees, 2010



Source: OECD, Database of economic incentives for environmental policy

Data source

Environmental tax revenue statistics can be estimated from the government annual financial results, just like the statistics for environmentally motivated subsidy statistics. First the tax revenue data can be put in relation to overall tax revenue in the country, or in relation to GDP, both making the indicator more comparable between countries. With further development, environmental tax revenue statistics can be allocated to tax payers. With this information it is possible to see how much environmental tax is paid by different industries, households and the public sector.

Currently Eurostat is collecting data on environmentally related taxes by industry in accordance with SEEA. In addition the OECD collects data in their database on environmental economic instruments. As with the data on subsidies the OECD collects the data from government ministries, some statistical offices and the OECD themselves. One Australian study noted that the data in the database on environmental taxes did not contain data in line with national Australian data sources (ABS 2012).