CEPS WORKING DOCUMENT
Thinking ahead for Europe

Resource Efficiency Indicators for Policy-Making

Arno Behrens, Igor Taranic and Vasileios Rizos

No. 415 / November 2015

Abstract

In the EU, resource efficiency has been high on the political agenda since 2011, when the European Commission first included it as one of the seven flagship initiatives in its Europe 2020 Strategy for "smart, sustainable and inclusive growth". Resource efficiency is not only considered an environmental necessity, but also a political, economic and security opportunity.

This paper first stresses the benefits and opportunities for the EU of improving its resource efficiency. It then explains the added value of the www.measuring-progress.eu web tool, which aims to improve the way policy-makers and others involved in the policy process can access, understand and use indicators for resource efficiency. It provides practical examples of relevant indicators in the form of the EU Resource Efficiency Scoreboard and a case study showing how the web tool established by NETGREEN can be used in practice. The paper concludes with a number of policy messages.

Main policy messages

- Effective resource-efficiency policies need to be linked to attractive visions for change. Indicators can be used to underpin these visions, providing scientific evidence for the benefits of resource efficiency.
- Introducing Raw Material Consumption (RMC), or an equivalent indicator, as a headline indicator in the Resource Efficiency Scoreboard would allow environmental policy and targets to focus solely on reducing material consumption as a proxy for environmental impact, cost and security.
- Harmonised methodology and data requirements for resource efficiency indicators are required across all levels, including EU member states, regions and at company level.
- Resource-efficiency indicators should take into account the entire supply chain, including indirect flows associated with processing products and trade flows.
- Improving resource efficiency in the EU will require strong private sector engagement.
- By linking indicators from various domains, the http://measuring-progress.eu web tool helps to establish the more systemic approach that is needed to improve resource efficiency across the EU.

NETGREEN Network for Green Economy Indicators

This paper was prepared in the context of NETGREEN, an EU-funded project that aims to advance progress towards a green economy.

ISBN 978-94-6138-483-6
Available for free downloading from the CEPS website (www.ceps.eu)

Contents

1. Introduction 1

2. More Efficiency, Less Cost 2

3. Policy Framework 3

4. Measuring Resource Efficiency 4

5. Added Value of NETGREEN 5

5.1 Introducing measuring-progress.eu 5

5.2 The Resource Efficiency Scoreboard in measuring-progress.eu 6

5.2.1 Lead Indicator – Resource Productivity 8

5.2.2 Thematic Indicator – recycling rate of municipal waste (%) 10

6. User Case Study – A practical application of measuring-progress.eu for business 11

7. Main Messages for Policy-Makers 12

References 14

Annex I – Full List of Resource Efficiency Indicators in NETGREEN 16

Resource Efficiency Indicators for Policy-Making

Arno Behrens, Igor Taranic and Vasileios Rizos*

CEPS Working Document No. 415 / November 2015

1. Introduction

The global use of natural resources has doubled over the past 30 years (SERI & WU Vienna, 2015, see also Behrens, 2007) and could triple by 2050 (UNEP, 2011). While Domestic Material Consumption (DMC)[1] continues to grow rapidly in many emerging and developing countries – mainly driven by population and economic growth, it has stabilised or even decreased in many industrialised countries, including in the European Union. In fact, DMC in the EU28 decreased by 11% between 2002 and 2014 (Eurostat, 2015b), mainly due to reductions in the consumption of non-metallic minerals and fossil fuels, but also due to the 'outsourcing' of resource-intensive production to third countries. Over the same time period, resource productivity in the EU increased by 28%, meaning that 28% more added value was created in 2014 from one unit of natural resources (measured in DMC) than in 2002 (Eurostat, 2015b).

European resource consumption remains high, however, at over 13 tonnes of DMC per capita in 2014 (Eurostat, 2015b). With high resource consumption and decreasing domestic resource extraction, the EU is increasingly dependent on imports of critical raw materials. This makes the EU particularly vulnerable to increasing scarcities, rising prices and price volatility, protectionist trade policies and political pressures from exporting countries. Similarly, historically high levels of resource consumption make the EU at least co-responsible for the disruption of various environmental systems around the globe, caused by land degradation, water and air pollution, loss of biodiversity and greenhouse gas emissions.

Resource efficiency is thus not only an environmental necessity but also an opportunity in terms of economics, politics and security. In particular, resource efficiency can reduce input costs for businesses, reduce resource dependency and associated import costs, help EU businesses to maintain global leadership in environmental technologies, and support job creation and economic growth.

This paper uses the term resource efficiency as defined by UNEP's International Resource Panel (IRP). It refers to resource efficiency as "the general concept of using less resource inputs to achieve the same or improved output (resource input/output)" (UNEP, 2011: 5). This can be applied at the level of individuals, companies, sectors or economies. The ultimate aim is to decouple resource use from economic output, thus allowing economies to grow while resource use is in decline (absolute decoupling).

This paper underlines the importance and potential benefits of higher resource efficiency and explains the added value of the NETGREEN project in presenting different indicators to

* Arno Behrens is a Research Fellow and Head of the Energy research programme at CEPS; Igor Taranic is a Research Assistant at CEPS; and Vasileios Rizos is a Researcher at CEPS.

[1] According to Eurostat (2015a), "Domestic Material Consumption (DMC) 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."

measure progress towards a more resource-efficient EU economy. It provides practical examples of relevant indicators in the form of the EU Resource Efficiency Scoreboard, as well as a case study showing how the 'measuring-progress.eu' online indicator tool established by NETGREEN can be used in practice. The paper concludes with key policy recommendations obtained from the analysis; the list of NETGREEN resource efficiency indicators is presented in Annex I.

2. More Efficiency, Less Cost

The EU makes up about 11% of the global population and is responsible for almost 19% of global resource consumption (Lutter, 2015). About one-third of EU resource consumption comes from imports. For example, in 2011 the EU imported almost 60% of its fossil fuels and metal resources (EEA, 2015), which together accounted for approximately one-third of all EU imports worth more than €500 billion. This strong (and growing) import dependence makes Europe "extremely vulnerable in the face of the global resource challenge" (Hedberg, 2014). This is true not just in terms of costs, but also in terms of price volatility and security of supplies. The UNEP (2014) reports substantial price rises in food, metals, rubber and energy since the year 2000, for example. In addition, some of the world's key metals will become increasingly scarce over the next 50 years, with adverse effects on many industries (ibid.).

Increasing resource efficiency thus provides opportunities beyond environmental protection. On the macro scale, the European Commission (2014) estimated that increasing resource efficiency could reduce the EU's total material requirements by 17-24%, boosting GDP and creating between 1.4 and 2.5 million jobs by 2030. Cambridge Econometrics (2011) estimated that implementing resource efficiency practices could boost the EU's annual GDP growth by 0.5-2%. All this underscores the necessity of resource efficiency, and open up numerous economic opportunities that are clearly in line with the European Commission's primary objective to boost growth and jobs in Europe (European Commission, 2014a).

Moreover, resource efficiency has very concrete benefits for business. Potential benefits from resource efficiency improvements vary between 10-17% of turnover in different sectors (AMEC & Bio Intelligence Service, 2013), helping European industry to save €630 billion a year (Hedberg, 2014). For example, the annual benefit for the EU's food and drink production industry could reach between €64-118 billion, depending on the level of implementation (AMEC & Bio Intelligence Service, 2013). In the UK alone, potential annual cost savings to companies from resource-efficiency measures could be around €26.5 (£23) billion[2] (UK Department for Environment, Food & Rural Affairs, 2011).

The public sector, a large consumer of water and energy, will also benefit from a better use of resources (Hedberg, 2014). In Ireland, a 33% saving in energy usage by 2020 could cut the public sector organisations' energy bill by €150 million per annum (Sustainable Energy Authority of Ireland, 2012). Households also benefit from energy and resource efficiency. For example, if the 20% energy efficiency target were to be achieved by 2020, European consumers would save €1,000 per household per year (European Commission, 2011a). Finally, some €500 per household could be saved annually if 60% of household food waste were avoided (European Commission, 2011b).

[2] According to 2011 exchange rates http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00033&plugin=1

3. Policy Framework

The transition to a resource-efficient economy requires the adoption of new technologies, new business models and a change in consumer behaviour. Such far-reaching changes need to be induced and supported by the right policy framework in terms of legislation, incentive systems and institutional reform. In the EU, resource efficiency has been high on the political agenda since 2011, when the European Commission included resource efficiency as one of the seven flagship initiatives in its Europe 2020 Strategy for "smart, sustainable and inclusive growth" (European Commission, 2011d). The flagship initiative for a "resource-efficient Europe" supports the shift towards a resource-efficient, low-carbon economy and provides a long-term framework for actions in policy areas such as climate change, energy, transport, industry, raw materials, agriculture, fisheries, biodiversity and regional development.

One of the key proposals under this initiative is the "Roadmap to a Resource Efficient Europe", which aims to transform the EU economy into a sustainable one by 2050. The roadmap identifies the economic sectors that consume the most resources, and suggests tools and indicators to improve resource efficiency. In particular, it identifies the food, building and transport sectors as responsible for the largest environmental impacts. In order to transform production and consumption patterns, the roadmap proposes measures such as incentives for investors to promote green innovation, a greater role for eco-design, eco-labelling, greener spending by public bodies, a shift in taxation away from labour towards pollution and resources, and the adaptation of prices that reflect the real costs of resource use. The roadmap also sets the goal of measuring progress with "robust and easily understandable indicators" (European Commission, 2011c), which we develop in the following sections.

Another milestone in setting a policy framework to improve resource efficiency is the 7th Environmental Action Programme (EAP), which will guide EU environmental policy until 2020. One of its three priority objectives is to turn the EU into a resource-efficient, green, and competitive low-carbon economy. Several actions are proposed to achieve this transition, including the full delivery of the Climate and Energy Package and its 20-20-20 targets for 2020; improvements of the environmental performance of products over their life cycle; and reductions of the environmental impacts of consumption. A special focus of the 7th EAP is on turning waste into a resource "with more prevention, re-use and recycling, and phasing out wasteful and damaging practices like landfilling" (European Commission, 2014b). The 7th EAP also echoes the Resource Efficiency Roadmap's call for the establishment of indicators and targets for resource efficiency, in order to guide public and private decision-makers towards more resource-efficient practices.

Finally, in September 2014 resource efficiency was integrated into the framework of the Circular Economy Package, which was withdrawn and is currently being revised by the European Commission. A new proposal to be tabled by the Commission later in 2015 will aim at creating "conditions for the development of a circular economy by addressing barriers and enabling the development of new markets and business models" (European Commission, 2015). Resource efficiency will be a central element of the new proposal, which will contain an Action Plan with key measures across the whole value chain.

The new proposal of the Circular Economy Package will also help to achieve the Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in September 2015. In fact, UNEP (2015) reports that 12 out of the 17 goals "promote human well-being through sustainable use of natural resources" (UNEP, 2015: 13). In addition, there is a

separate goal (Goal 12) that explicitly aims to reshape consumption and production patterns in view of "the sustainable management and efficient use of natural resources" by 2030.

Another initiative worth mentioning on the international level is the voluntary Alliance on Resource Efficiency, which was initiated at the G7 Elmau meeting in June 2015. This alliance will serve as a knowledge-sharing forum on resource efficiency issues for private and public sectors.

4. Measuring Resource Efficiency

Given the huge number of natural resources with different characteristics, it is extremely complex to develop indicators that properly reflect resource use and its impacts on environment, economy and security. BIO Intelligence Service et al., (2012) distinguish between four key categories of resource use: material use, energy use and climate change, water use and land use. For each of them, they present indicators related to the scale of consumption (resource use) and related to the impact of consumption on the environment (environmental impact). Furthermore, they distinguish between indicators reflecting domestic consumption and impacts, and those that relate to global demand and impacts. In total, and as shown in Figure 1, they propose 16 indicators, all capable of measuring certain aspects of resource use.

Figure 1. The basket of resource use relevant indicators

	Resource use-oriented		Environmental impact-oriented	
	Domestic resource use *(resources directly used for domestic production and consumption)*	***Global resource demand*** *(domestic resource use plus resource use embodied in trade)*	***Environmental impacts related to domestic resource use***	***Environmental impacts related to global resource demand***
Material use	Domestic material use **Domestic Material Consumption**	Global material demand **Raw Material Consumption**	***Territorial part of*** Life-Cycle Resource Indicator *(of Environmentally-weighted Material Consumption)**	Life-Cycle Resource Indicator *(Environmentally-weighted Material Consumption)**
Energy use and climate change	Domestic energy use **Gross Inland Energy Consumption**	Global energy demand **Energy Footprint**	Domestic GHG emissions **Territorial GHG Emissions**	Global GHG emissions **Carbon Footprint**
Water use	Domestic water use **Water consumption** *(Water abstraction)**	Global water demand **Water Footprint**	Domestic water exploit. **Water Exploitation Index**	Global water exploit. **Global Water Consumption Index**
Land use	Domestic land use **Domestic Land Demand**	Global land demand **Actual Land Demand (Land Footprint)**	Domestic LU intensity **Human Appropriation of Net Primary Production**	Global LU intensity ***eHANPP, LEAC and other indicators on ecosystem quality***

Source: BIO Intelligence Service et al. (2012).

Three main problems emerge from such a complexity of indicators for one topic. First, for communication purposes it is often advantageous for policy-makers to resort to a few (ideally only one) aggregated indicators. This facilitates measuring progress towards agreed

targets or objectives and makes it easier to communicate this to the public.[3] The question of how to aggregate resource-use indicators has still not been addressed satisfactorily. In essence, the choice is between a highly aggregated 'one-size-fits-all' indicator that gives a skewed picture of reality or a set of indicators that are comprehensive but less suitable for political and communication purposes. Eurostat's Resource Efficiency Scoreboard (see below) is an attempt to overcome this dilemma by using both a single headline indicator and more disaggregated thematic indicators.

Second, not all indicators are based on the same degree of robust data and methodological rigour. Harmonisation and comparison between all 28 EU member states remains difficult. Territorial indicators (related to domestic resource use and environmental impacts) are usually based on solid data and data quality, but they illustrate only the national dimension and are thus not robust against outsourcing (Lutter, 2015). Footprint indicators, on the other hand, can illustrate the global dimension and are thus robust against outsourcing, but they are based on modelling approaches, with little control over data quality. This results in low acceptance among statistical offices and policy-makers (Lutter, 2015).

Third, because of uncertainties regarding 'biophysical limits', many indicators cannot provide information about environmental impact thresholds and related potential policy targets. More research is needed on how to combine amounts of resources used with related environmental impacts.

5. Added Value of NETGREEN

5.1 Introducing measuring-progress.eu

"You cannot manage what you cannot measure" is a much-cited maxim that highlights the importance of performance indicators in management and policy-making. Indicators are also essential for increasing resource efficiency, allowing policy-makers to identify priority issues and to formulate, assess, monitor and evaluate corresponding policies (UNEP, 2014). Finding suitable indicators, however, can be a difficult task in light of the large number of – often complex – available indicators. In addition, the multitude of existing indicators can create confusion and difficulty in fully understanding and interpreting their underlying concepts (Rizos et al., 2015).

The NETGREEN project aims to facilitate the identification of the most relevant green economy indicators and to explain their benefits and drawbacks. Through an open-access, searchable web tool (measuring-progress.eu), the project provides policy-makers and other users[4] with a unique point of entry into the vast landscape of green economy indicators, including resource-efficiency indicators. The tool offers a concise collection of green economy indicators[5] accompanied by easy-to-understand information that can help users who are not necessarily familiar with scientific terminologies to interpret results and select the indicators most suited for their analysis. The general information about each indicator is

[3] Results from using one indicator for one complex topic should be interpreted with caution and treated as indicative of the overall performance in this topic; otherwise they may result in misleading policy messages (Rizos et al., 2015).

[4] E.g. researchers, business strategists, campaigners etc.

[5] At the time of writing the tool includes 260 fully described indicators, over 500 additional indicators, over 900 keywords, 102 green economy topics, and linkages between indicators, keywords and topics.

complemented by detailed information about data availability (e.g. geographical coverage, frequency of updates, cost etc.) about how each indicator is constructed (e.g. specifying various components for composite indicators), about the quality of indicators, their contribution to the green economy, and potential misinterpretations. In addition, the web tool provides further indicator suggestions that can broaden users' viewpoints and help them integrate alternative green economy considerations into their analysis.

Aiming to address the needs of policy-makers and experts with different backgrounds and knowledge about the green economy, the design of the web tool enables users to obtain indicator suggestions in three different ways: i) by using the keyword search (e.g. resource efficiency, natural resources trade, water use etc.), ii) by choosing one or several topics from a "tree of green economy topics" (e.g. "resources use" as a sub-branch of "environmental sustainability"), and iii) by free text search. Table 1 below offers an example of the results obtained under search option 2, providing two examples of "green economy topics" available in the web tool, together with a small selection of indicator suggestions linked to these outcomes.

Table 1. Illustrative "green economy topics" and examples of related indicators

Topic	Indicator suggestions (sample)
Resources use (materials, energy, water, land)	- Resource efficiency scoreboard - Domestic material consumption per capita - Ecological Footprint - Share of energy from renewable sources - Recycling rate of municipal waste (%) - Employment in eco-industries and circular economy (% of total employment across all companies)
Green technological development and use	- Eco-innovation index - MSCI Global Clean Technology Index - Turnover from innovation - Green patents, Index 1990=100 - Firms having implemented innovation activities aiming at a reduction of energy input per unit output (% of total firms)

5.2 *The Resource Efficiency Scoreboard in measuring-progress.eu*

As noted by EEA (2015), quantifying resource efficiency is a complex task. This is due to the wide variety of natural resources and the many differences between them: "some are non-renewable, some renewable; some are depletable, others are not; some are hugely abundant, some extremely scarce" (EEA, 2015). Furthermore, some natural resources are highly toxic but often limited in quantity, while others are nontoxic but used in very large amounts. In addition, the timing and location of resource use can affect environmental impacts. As a result, it is very difficult to provide a meaningful yet simple measure of resource efficiency.

Nevertheless, and as noted above, the "Roadmap to a Resource Efficient Europe" tasked the European Commission to come up with robust and easily understandable indicators to support policy-makers in their efforts to increase resource efficiency in Europe. The result

was the so-called 'Resource Efficiency Scoreboard', first published by Eurostat in December 2013 and updated annually.

In order to provide simple measures and to reflect the complexity of the issue, the Resource Efficiency Scoreboard (henceforth referred to simply as the 'Scoreboard') provides a set of indicators organised in three layers:

- One lead indicator (resource productivity),
- A dashboard of nine complementary macro-indicators on materials, carbon, land and water, focusing on resource use and its environmental impacts (domestic and global perspective), and
- A set of 22 thematic indicators to monitor the transformation of the economy (waste, innovation, taxes), natural capital (biodiversity, air, land and soils) and key sectors (food, buildings, mobility).

Box 1 shows the kind of general information that is available about the Scoreboard on measuring-progress.eu. Similar information is available about other indicators. In the following, we also show how the lead indicator (resource productivity) and one sample thematic indicator (recycling rate of municipal waste) are covered in the web tool.

Box 1. Resource Efficiency Scoreboard in measuring-progress.eu

Description: The Resource Efficiency Scoreboard is a tool/user interface for presenting key indicators relating to natural resources. A limited set of already available indicators was selected, covering as many of the themes and subthemes identified in the Roadmap to a Resource Efficient Europe as possible. It is a three-tier system based on a lead indicator, a dashboard of indicators and a set of theme specific indicators:

- One lead indicator – focus on resource productivity

- 9 dashboard indicators with focus on materials, carbon, land and water;

- 22 thematic indicators with a focus on subjects such as economy, waste management, air and others

Data host: Eurostat

Link to data: http://ec.europa.eu/eurostat/cache/REIs/REIs_EN_banner.html

Type of Indicator source: Statistical office

Geographical coverage: Austria, Belgium, Bulgaria, Croatia, Cyprus Czech Republic, Denmark, Estonia, Finland, France FYROM, Germany, Greece, Hungary, Iceland, Ireland Italy, Latvia, Lithuania, Luxembourg Malta, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania Serbia, Slovakia Slovenia, Spain, Sweden, Switzerland, Turkey, the UK.

Geographical level: national

Temporal coverage: 2000 to 2014

Frequency of updates: annual

Cost of accessing data: free of charge

Indicator developer: European Commission

Aggregation level of indicator: aggregate

Methodological transparency: partial methodology available (link available)

Contribution to the green economy: The resource efficiency scoreboard indicators reflect the situation of the environmental sustainability and economic sustainability and resilience; thus contributing to measuring the progress towards the green economy. Note that this indicator is composited, which means trends of one or several indicators that are part of this composited indicator could be masked by trend of other indicators. For further assessments and a correct interpretation of this indicator, please check the respective single indicators.

Potential misinterpretations: Is resource efficiency increasing, but efficiency gains compensated by the overall consumption? (Related indicators: Domestic Material Consumption – DMC). Are resource efficient processes, which might be the reason for efficiency gains, very energy intense? (Related indicators: Final energy consumption by sector).

5.2.1 Lead Indicator – Resource Productivity

The 'lead indicator' of the Resource Efficiency Scoreboard aims to represent the change in natural resource use in one single indicator. It serves as a proxy for measuring resource efficiency. As proposed by the European Commission, "resource productivity" has been selected as the lead indicator, measured by the ratio between GDP and Domestic Material Consumption (EUR/tonne). The indicator Domestic Material Consumption (DMC) is based on the Economy-wide Material Flow Accounts (EW-MFA) and reports 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" (Eurostat, 2015a).

Resource productivity is thus a measure of how efficiently the economy uses material resources to produce wealth (European Commission, 2014c). It can improve with increases in GDP and with reductions in DMC.

In the EU, resource efficiency has increased from €1.53/kg in 2002 to €1.95/kg in 2014. This means that in 2014 almost 28% more added value was created per unit of DMC than in the year 2002, indicating some decoupling between economic growth and resource use. However, these aggregate figures hide large differences between member states, which are partly due to differing economic structures but also due to differences in technological efficiency itself. Resource productivity is highest in Luxembourg, the Netherlands and in the United Kingdom (ranging between €3-4/kg). Countries with the lowest resource productivity in the EU include Bulgaria and Romania (below €0.4/kg) (Eurostat, 2015b).

The Commission notes that the indicator has several shortcomings, which are related to the indicator DMC. Taking a national perspective and including only net imports of resources, the indicator is insensitive to materials consumed in the production of imports in third countries. In addition, by measuring material consumption by weight, it gives no information about the scarcity, economic value or environmental impact of natural resources. As a result, Eurostat is investigating an alternative formula for the lead indicator 'resource productivity', in which DMC could be replaced by Raw Material Consumption (RMC).[6]

[6] According to Eurostat (2015a), raw material consumption (RMC) is defined as the annual quantity of raw materials extracted from domestic territory, plus all physical imports and minus all physical exports (both expressed in raw material equivalents). Eurostat has developed a model to estimate RMC for the aggregated EU economy".

Box 2 below shows how the lead indicator 'resource productivity' is represented in the measuring-progress.eu web tool.

Box 2. Resource Productivity indicator in measuring-progress.eu

Description: Resource productivity is defined as the ratio between gross domestic product (GDP) and domestic material consumption (DMC). The indicator Domestic Material Consumption (DMC) is based on the Economy-wide Material Flow Accounts (EW-MFA). The indicator is the lead indicator of the resource efficiency scoreboard.

Data host: Eurostat

Unit of measurement: Euro per kilogram (EUR/Kg)

Link to data:
http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdpc100&plugin=1

Type of Indicator source: Statistical office

Geographical coverage: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, the UK.

Geographical level: national

Temporal coverage: 2000 to 2013

Frequency of updates: annual

Cost of accessing data: free of charge

Indicator developer: Eurostat

Aggregation level of indicator: single

Methodological transparency: complete methodology available (link available)

Data quality assessment: assessed by statistical office

Contribution to the green economy: the amount of GDP generated by unit of material resource use is a measure of efficiency. The more you do with one unit of material resources the more sustainable the economy; i.e. the bigger ratio of EUR/Kg, the better the progress towards the green economy.

Potential misinterpretation: Is productivity rising, but outweighed by overall DMC? If so, which components of DMC are increasing? (Related indicator: Components of Domestic Material Consumption)

Potential misinterpretation: Does productivity appear to be improving, due to changes in GDP? (Related indicator: GDP – current USD)

Potential misinterpretation: Does productivity appear to be improving, due to changes in GDP? (Related indicator: energy efficiency and energy consumption in industry).

5.2.2 *Thematic Indicator – recycling rate of municipal waste (%)*

The measuring-progress.eu web tool includes all 32 indicators of the Resource Efficiency Scoreboard - 1 lead indicator, 9 dashboard indicators and 22 thematic indicators. To showcase the presentation of indicators on the web tool, in this section we provide information about one of the thematic indicators: the recycling rate of municipal waste.[7]

The average municipal recycling rate in the former EU27 increased from 25% in 2000 to 42% in 2013. Similar to other EU-wide indicators, these figures mask big differences between member states, ranging from less than 3% in Romania to almost 65% in Germany (Eurostat, 2015c).

Recycling and re-use of municipal waste was one of the most contentious issues in the first Circular Economy Package (see above). A proposed binding target of 70% recycling/re-use of municipal waste by 2030 met with a lot of resistance from some member states and Members of the European Parliament, and was one of the reasons for the withdrawal of the original Circular Economy Package by the European Commission and its ongoing revision.

Box 3 shows how this thematic indicator is presented in measuring-progress.eu.

Box 3. Recycling rate of municipal waste (%) indicator in measuring-progress.eu

Description: The recycling rate is the tonnage recycled from municipal waste divided by the total municipal waste occurring. Recycling includes material recycling, composting and anaerobic digestion. Municipal waste largely consists of waste generated by households, but may also include similar wastes generated by small businesses and public institutions and collected by the municipality.

The indicator is a part of the Resource Efficiency Scoreboard.

Data host: Eurostat

Unit of measurement: Percentage (%)

Link to Data:
http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=t2020_rt120&tableSelection=1

Type of indicator source: Statistical office

Geographical coverage: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, the UK.

Geographical level: National

Temporal coverage: 1995 to 2013

Frequency of updates: annual

Cost of accessing data: free of charge

Aggregation level of indicator: single

[7] Municipal waste largely consists of waste generated by households and may also include waste generated by public institutions and small businesses, but it does not include industrial and agricultural waste (Eurostat 2015c).

Methodological transparency: Complete methodology available (link available)

Data quality assessment: other organisational assessment

Contribution to the green economy: Recycling of waste contributes to circular economy reducing material use and extraction; thus positively impacting the progress towards the Green Economy.

Potential misinterpretation: Municipal waste is only one part of the total waste generated in the economy. The proportion and types of waste handled by different countries might differ, distorting country comparisons. (Related indicator: Total waste generated).

Potential misinterpretation: High recycling rate can go hand in hand with high material use, if material-intensive lifestyles prevail. (Related indicator: Domestic Material Consumption by material).

6. User Case Study – A practical application of measuring-progress.eu for business

This chapter provides an example of how the measuring-progress.eu web tool can be used in practice. Below is a hypothetical 'user case study' to illustrate the added value of the NETGREEN project and the measuring-progress.eu web tool. It shows how the tool can improve decision-making in a business environment with the aim to reduce resource use.

A London-based company providing consultancy services to the public sector in the areas of energy, water, resources and waste management is seeking to expand its activities to Eastern Europe. Following the European Commission's recent Circular Economy Package consultation process, the company wants to explore how it can bring its knowledge and international experience to contribute to the transition to a circular economy.

Remembering the presentation of the measuring-progress.eu online tool at the 'resource efficiency workshop' at CEPS in March 2015, the company's business development officer found more information about the *Resource Efficiency Scoreboard*[8] via this tool. In its description she saw that waste management is part of the scoreboard and was directed to the information about the indicator on *"recycling rate of municipal waste"*.[9] Following the link to the Eurostat data presented in the indicator description, she found that Romania has the biggest potential for improving its municipal waste management, as its current recycling rate stands at less than 3% (Eurostat, 2015c). The country joined the EU in 2007 and consequently adopted the EU's legislation, including the Waste Framework Directive. It developed its first National Waste Management Strategy for the period of 2007-2013, the implementation of which was less successful than expected (ENVIROPLAN S.A., 2012). One of the reasons preventing Romania from achieving significant progress in recycling was the lack of know-how (Ziehenberger et al., 2015).

In 2014, the second Romanian Waste Management Strategy was adopted, stating the target of 50% of recycling/re-use of municipal waste by 2020 (Romanian Ministry of Environment, 2014). Given the current recycling rate of less than 3%, this target is a challenging one. The consultancy company had gained vast experience in Slovenia, which in ten years has made

[8] http://measuring-progress.eu/resource-efficiency-scoreboard

[9] http://measuring-progress.eu/recycling-rate-municipal-waste

impressive progress in municipal waste recycling, from 12% to 42% of (Eurostat, 2015). The management believed that the company had the much needed know-how to contribute to Romanian waste management and to reach the 50% recycling target by 2020. The company therefore made the decision to follow the calls for public tenders on waste management in Romania.

7. Main Messages for Policy-Makers

Indicators play a crucial role in improving resource efficiency. As noted above, they are required for the identification of potentially worrying trends and priority issues for policy, but they are also indispensable for the formulation, assessment, monitoring and evaluation of resource-efficiency policies in Europe and elsewhere. However, the question remains: Which (set of) indicators are the most useful to measure progress towards a green and more resource efficient economy?

- **Policies require a vision, indicators can provide scientific evidence**

A lack of data and indicators is often used as a pretext for no action or delayed action on the policy level. NETGREEN shows that a multitude of indicators exist, but stakeholder consultations during the project have also shown that resource- efficiency policies will only be successful if they are linked to attractive visions for change. Indicators can be used to underpin this vision, providing scientific evidence for the benefits (and costs) that resource efficiency can bring. Eventually, and as indicators mature, they can also be used to set concrete targets, e.g. in terms of RMC or resource productivity.

- **The importance of choosing the right headline indicator**

Of particular importance for political accountability and communication is the choice of headline indicator. The current Resource Efficiency Scoreboard uses 'resource productivity', defined as GDP/DMC, as the single headline indicator. This indicator has three shortcomings. First, the DMC indicator does not take into account indirect materials of imported and exported products. DMC is thus not robust against outsourcing material-intensive industries or processes to other countries and substituting domestic extraction by imports. Second, GDP-linked indicators mask the substantial structural differences between EU economies. Countries with larger shares of the service sector will naturally perform better in terms of resource efficiency. Third, improved resource productivity can derive from an increase in GDP, a decrease in DMC, or both. However, the GDP/DMC indicator does not show whether resource use has actually decreased or even increased.

To overcome these issues, the use of RMC (or an equivalent indicator) as the headline indicator should be considered. This would solve the issue of outsourcing production abroad and of varying economic structures across EU member states. Instead, and once fully mature, the RMC indicator would allow focus on environmental policy and targets solely on reducing material consumption as a proxy for environmental impact, costs and security (similar to CO_2 emissions as a proxy for climate change in energy policy).

- **More harmonisation of indicators needed on all levels**

The development of methodologically sound indicators based on complete and robust data is thus a prerequisite for EU action on resource efficiency. This also requires a harmonisation

of methodology and data requirements across all levels, including EU member states, regions and at the company level.

Indeed, an analysis of the Resource Efficiency Scoreboard shows that EU-wide indicators cannot cover all the needs in resource efficiency measurement across all the regional/local authorities. Different regions may have different types of resource use. For instance, industrial North-Rhine Westphalia in Germany has a different impact from service-oriented Luxembourg. Flanders, Belgium, is a good example of the development of regional indicators, based on specific local needs.[10] Therefore, the development of (harmonised) regional/local indicators should be supported by policy-makers at all levels.

The same is true for the company level, where the use of harmonised resource use/efficiency indicators could become incorporated into standard accounting practices.

- **Taking the entire supply chain into account**

In order to understand the full environmental impact of consumption, indicators should not only take into account the direct resource inputs but also the indirect material flows along the (global) supply chain of goods and services consumed in a country. This includes the indirect flows associated with processing products and with trade flows.

- **Breaking the 'silo mentality'**

The NETGREEN project and its measuring-progress.eu web tool provides a unique structure for existing green economy indicators in five areas: environment, sustainability, social justice, quality of life, economic sustainability and resilience, and effective governance.

As such, the measuring-progress.eu web tool can help policy-makers and other stakeholders to find the right indicators, also related to resource efficiency. By linking indicators from various domains, the tool also helps to overcome the 'silo mentality', thus helping to establish the more systemic approach needed to improve resource efficiency across the EU.

- **No resource efficiency without the private sector**

Improving resource efficiency in the EU will require a strong engagement on the part of the private sector. Policy-makers and business leaders will thus need to marry political commitments with business opportunities. The essential building blocks of such a strategy could be Public-Private-Partnerships (PPPs) on all levels (regional, national, EU and global); the introduction of harmonised resource-use indicators on the company level as part of (compulsory) reporting requirements; and support from the public sector through public procurement of goods and services aimed at increasing resource efficiency. While the current focus of the measuring-progress.eu web tool is on policy-makers, it could be expanded to the business sector with relevant indicators in the future.

[10] For example, the Flanders Materials Programme includes a priority to develop Flemish indicators for recycling plastics, which can be compared to best practices in Europe.

References

AMEC & Bio Intelligence Service (2013), "The opportunities to business of improving resource efficiency" (http://ec.europa.eu/environment/enveco/resource_efficiency/pdf/report_opportunities.pdf).

Behrens, A., S. Giljum, J. Kovanda and S. Niza (2007), "The Material Basis of the Global Economy – World-wide Patterns in Natural Resource Extraction and their Implications for Sustainable Resource Use Policies", *Ecological Economics,* Vol. 64, No. 2, pp. 444-453.

BIO Intelligence Service, Institute for Social Ecology and Sustainable Europe Research Institute (2012), *Assessment of resource efficiency indicators and targets*, Final Report prepared for the European Commission, DG Environment (http://ec.europa.eu/environment/enveco/resource_efficiency/pdf/report.pdf).

Cambridge Econometrics (2011), *Studies on Sustainability Issues – Green Jobs: Trade and Labour*, Final Report for the European Commission, DG Employment, Cambridge, UK: Cambridge Econometrics.

CEPS (ed.) (2015), *Maximizing resource efficiency throughout the EU economy*, CEPS, Brussels (www.ceps.eu/sites/default/files/Proceedings%20of%20the%20workshop%20on%20Resource%20Efficiency.pdf).

EEA (2015), "European briefings: Resource efficiency", *SOER 2015*.

Ellen Macarthur Foundation (2015), "Rethink the Future", Conference Presentation, 2015 European Circular Economy Conference, Brussels.

ENVIROPLAN S.A. (2012), *Romania - Identification of future waste management projects (2014-2020): Task 1 Baseline report*, Final Baseline Report ordered by the EIB (www.posmediu.ro/upload/pages/Baseline_final%20report.pdf).

European Commission (2011), "Analysis associated with the Roadmap to a Resource Efficient Europe, Part 1", Commission Staff Working Paper, COM (2011) 1067 final, Brussels (http://ec.europa.eu/environment/resource_efficiency/pdf/working_paper_part1.pdf).

European Commission (2011), "Analysis associated with the Roadmap to a Resource Efficient Europe, Part 2", Commission Staff Working Paper, COM (2011) 1067 final, Brussels (http://ec.europa.eu/environment/resource_efficiency/pdf/working_paper_part2.pdf).

European Commission (2011), "Roadmap to a Resource Efficient Europe", Communication, COM (2011) 571 final, Brussels (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0571&from=EN).

European Commission (2011), *Europe 2020: A European strategy for smart, sustainable and inclusive growth* (http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf).

European Commission (2014), "An Investment Plan for Europe", COM(2014) 903 final, Brussels (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0903&from=EN).

European Commission (2014), *Living well, within the limits of our planet: General Union Environment Action Programme to 2020*, Luxembourg: Publications Office of the European Union.

European Commission (2014), *Resource Efficiency Scoreboard 2014 Highlights* (http://ec.europa.eu/environment/resource_efficiency/documents/re_scoreboard_2014_highlights.pdf).

European Commission (2015), *Circular Economy Strategy: Indicative Roadmap* (http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf).

Eurostat (2015), *Material flows and resource productivity* (http://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity).

Eurostat (2015) *Material flows and resource productivity: main tables* (http://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity/main-tables).

Eurostat (2015) *Recycling rate of municipal waste* (http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=t2020_rt120&tableSelection=1)

Hedberg, A. (2014) "Better use of resources is the means to growth, prosperity and welfare – but will the EU jump on the opportunity?", Commentary, European Policy Center (www.epc.eu/documents/uploads/pub_4841_towards_a_sustainable_economy.pdf).

Lutter, S. (2015), "Enhancing resource efficiency – a research perspective", NETGREEN Thematic Policy Workshop (www.ceps.eu/sites/default/files/Enhancing%20resource%20efficiency%20%E2%80%93%20a%20research%20perspective.pdf).

Rizos, V., A. Behrens and I. Taranic (2015), "Measuring progress in eco-innovation" (www.ceps.eu/system/files/WD409%20NETGREEN%20policy%20brief_Eco-Innovation_final.pdf).

Romanian Ministry of Environment (2014), *National Waste Management Strategy 2 (2014-2020)*, available only in Romanian (www.mmediu.ro/img/attachment/37/strategii-planuri-studii-54786031cda10.pdf).

SERI and WU Vienna (2015), "The online portal for material flow data" (www.materialflows.net).

Sustainable Energy Authority of Ireland (2012), *Energy Use in the Public Sector* (www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Energy_Use_in_the_Public_Sector.pdf).

UK Department for Environment, Food & Rural Affairs (2011), *Research shows companies can save money by helping the environment* (https://www.gov.uk/government/news/research-shows-companies-can-save-money-by-helping-the-environment).

UNEP (2011), *Decoupling Natural Resource Use and Environmental Impacts from Economic Growth: A Report of the Working Group on Decoupling to the International Resource Panel, Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., Sewerin, S.* (www.unep.org/resourcepanel/decoupling/files/pdf/Decoupling_Report_English.pdf).

UNEP (2014), *Using Indicators for Green Economy Policymaking* (www.unep.org/greeneconomy/Portals/88/documents/GEI%20Highlights/UNEP%20INDICATORS%20GE_for%20web.pdf).

UNEP (2015), *Policy Coherence of the Sustainable Development Goals: A Natural Resource Perspective* (www.unep.org/resourcepanel/Portals/50244/publications/Policy_Coherenceofthe_Sustainable_DevelopmentGoals.pdf).

Ziehenberger, G., M. Heigl, R. Dornauer and H. Klampfl-Pernold (2015), "Experiences in new EU Accession Countries" (http://www.vivis.de/phocadownload/2014_wm/2014_wm_87_100_ziehenberger.pdf)

Annex I – Full List of Resource Efficiency Indicators in NETGREEN

EU Resource Efficiency Scoreboard in measuring-progress.eu	
Resource Efficiency Scoreboard	http://measuring-progress.eu/resource-efficiency-scoreboard
Lead Indicator	
Resource Productivity	http://measuring-progress.eu/resource-productivity-gdpdomestic-material-consumption
Dashboard Indicators - materials	
Domestic Material Consumption per capita	http://measuring-progress.eu/domestic-material-consumption-capita-0
Dashboard Indicators - land	
Productivity of artificial land	http://measuring-progress.eu/productivity-artificial-land
Built-up areas	http://measuring-progress.eu/built-areas
Dashboard Indicators - water	
Water Exploitation Index	http://measuring-progress.eu/water-exploitation-index-wei
Water Productivity	http://measuring-progress.eu/water-productivity
Dashboard Indicators - carbon	
Greenhouse Gas Emissions per capita	http://measuring-progress.eu/greenhouse-gas-emissions-capita
Energy Productivity	http://measuring-progress.eu/energy-productivity-gdpgross-inland-energy-consumption
Energy Dependence	http://measuring-progress.eu/energy-dependence
Share of renewable energy in gross final energy consumption	http://measuring-progress.eu/share-renewable-energy-gross-final-energy-consumption
Thematic Indicators – Transforming the Economy	
Generation of waste excluding major mineral wastes	http://measuring-progress.eu/generation-waste-excluding-major-mineral-wastes-0
Recycling rate of municipal waste	http://measuring-progress.eu/recycling-rate-municipal-waste
Recycling rate of e-waste	http://measuring-progress.eu/recycling-rate-e-waste-0
Thematic Indicators – Supporting Research and Innovation	
Eco-Innovation index	http://measuring-progress.eu/eco-innovation-index
Thematic Indicators – getting the prices right	
Total environmental tax revenues as a share of total revenues from	http://measuring-progress.eu/total-environmental-tax-revenues-share-total-revenues-taxes-and-social-contributions

taxes and social contributions	
Energy taxes by paying sectors - Households	http://measuring-progress.eu/energy-taxes-paying-sector
Thematic Indicators – Nature and Eco-systems	
Index of common farmland bird species	http://measuring-progress.eu/common-bird-index-0
Area under organic farming	http://measuring-progress.eu/area-under-organic-farming-1
Landscape fragmentation	http://measuring-progress.eu/landscape-fragmentation-0
Urban population exposure to air pollution by particulate matter	http://measuring-progress.eu/urban-population-exposure-air-pollution-particulate-matter-0
Urban population exposed to PM10 concentrations exceeding the daily limit value	http://measuring-progress.eu/eu-urban-population-exposed-pm10-concentrations-exceeding-daily-limit-value
Soil erosion by water – area eroded by more than 10 tonnes per hectare per year	http://measuring-progress.eu/soil-erosion-water-area-eroded-more-10-tonnes-hectare-year
Gross nutrient balance in agricultural land - nitrogen	http://measuring-progress.eu/gross-nutrient-balance-agricultural-land-nitrogen
Gross nutrient balance in agricultural land - phosphorus	http://measuring-progress.eu/gross-nutrient-balance-agricultural-land-phosphorus
Daily calorie supply per capita by source - total	http://measuring-progress.eu/daily-calorie-supply-capita-source-total
Final energy consumption in households by fuel - total petroleum products	http://measuring-progress.eu/final-energy-consumption-households-fuel-total-petroleum-products
Average carbon dioxide emissions per km from new passenger cars	http://measuring-progress.eu/average-carbon-dioxide-emissions-km-new-passenger-cars-0
Pollutant emissions from transport	http://measuring-progress.eu/pollutant-emissions-transport
Modal split of passenger transport	http://measuring-progress.eu/modal-split-passenger-transport
Modal split of freight transport	http://measuring-progress.eu/modal-split-freight-transport

Additional resource efficiency indicators in measuring-progress.eu	
Abiotic material productivity incl. industrial minerals and metals, US$ per kg	http://www.measuring-progress.eu/abiotic-material-productivity-incl-industrial-minerals-and-metals-us-kg
Domestic Extraction (used/unused/total)	http://www.measuring-progress.eu/domestic-extraction-usedunusedtotal
Domestic Material Consumption (DMC)	http://www.measuring-progress.eu/domestic-material-consumption-dmc
Domestic material consumption by material	http://measuring-progress.eu/domestic-material-consumption-material
Ecological Footprint	http://measuring-progress.eu/ecological-footprint
Emission of acidifying substances	http://measuring-progress.eu/emission-acidifying-substances
Emissions of non-methane volatile organic compounds (NMVOC), by source sector	http://measuring-progress.eu/emissions-non-methane-volatile-organic-compounds-nmvoc-source-sector
Emissions of organic matter	http://measuring-progress.eu/emissions-organic-matter
Energy efficiency and energy consumption in industry	http://measuring-progress.eu/energy-efficiency-and-energy-consumption-industry
Energy Resources	http://measuring-progress.eu/energy-resources
EU Imports from developing countries by group of products	http://measuring-progress.eu/eu-imports-developing-countries-group-products
EU imports from least-developed countries by group of products	http://measuring-progress.eu/eu-imports-least-developed-countries-group-products
Fresh Water Resources	http://measuring-progress.eu/fresh-water-resources
Greenhouse gas emissions	http://measuring-progress.eu/greenhouse-gas-emissions
Nitrogen oxides emissions	http://measuring-progress.eu/nitrogen-oxides-emissions
Municipal waste generation	http://measuring-progress.eu/municipal-waste-generation
Share of energy from renewable sources	http://measuring-progress.eu/share-energy-renewable-sources
Water scarcity index	http://measuring-progress.eu/water-scarcity-index

NETGREEN
Network for Green Economy Indicators

About NETGREEN

NETGREEN is an EU-funded project that aims to advance progress towards a green economy. The key output of the project is an open access, interactive website (www.measuring-progress.eu) providing information on green economy indicators. Partners in NETGREEN are: Ecologic Institute (lead partner), the Centre for European Policy Studies (CEPS), the New Economics Foundation (NEF), LEI Wageningen UR, the Centre for Environmental and Sustainability Research (CENSE) and the Green Economy Coalition (GEC).

ACKNOWLEDGEMENT & DISCLAIMER

The research leading to these results has received funding from the European Union FP7 ENV.2013.6.5-1: Network for green growth indicators under the grant agreement n° 308680.

eco logic · CENSE center for environmental and sustainability research · nef economics as if people and the planet mattered · CEPS · green economy coalition · LEI WAGENINGEN UR