EUROPEAN COMMISSION
DIRECTORATE-GENERAL
ENVIRONMENT

Consultation Paper:
Options for Resource Efficiency Indicators

Executive Summary

In its Roadmap to a Resource Efficient Europe[1] (henceforth 'Roadmap'), the Commission proposed a pathway to action for a resource efficient Europe.

Indicators are needed to monitor progress and to allow for benchmarking and comparison between Member States. In the Roadmap, the Commission announced that it would launch a joint effort with stakeholders to define indicators and targets for guiding actions and monitoring progress on the path to the 2050 resource efficiency vision.

The Roadmap also sets out a list of possible indicators in its Annex 6[2]. These indicators follow a three-tiered approach to measuring progress towards a resource efficient, low-carbon economy:

- The Commission proposed 'resource productivity' (GDP/DMC[3]) as a **provisional lead indicator** as the best available proxy for resource efficiency.

- This lead indicator is complemented by a second tier **dashboard of complementary macro indicators** on land, water and carbon.

- The third tier consists of **theme specific indicators** to measure progress towards specific key thematic objectives and the actions and milestones set out in the Roadmap.

A first draft scoreboard proposed in annex provides an intermediate step on the way to developing an agreed set of resource efficiency indicators and possible targets by 2013.

The purpose of this consultation paper and its annexes is to inform stakeholders about the analysis on resource efficiency indicators undertaken by the Commission so far, to stimulate responses and ideas from individuals and organisations and to allow for informed discussion.

The Commission's aim is to gather a wide range of options and ideas on how we can best measure, monitor and communicate the interlinkages between the economy and natural resources.

[1] COM(2011) 571, 'Roadmap to a Resource Efficient Europe'
http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf
[2] http://ec.europa.eu/environment/resource_efficiency/targets_indicators/roadmap/index_en.htm
[3] Domestic Material Consumption

Stakeholders are invited to respond to the following questions by 22 October 2012 via DG Environment's consultation web page: http://ec.europa.eu/environment/consultations_en.htm

Questions

1) What are the key issues that need to be addressed by indicators to support resource policy?

2) Are there other indicators that we should be using to monitor the economic and environmental impacts of resource efficiency policies by 2013 and for the future? More specifically:

a) Is the proposed lead indicator, GDP/DMC an appropriate indicator to measure resource efficiency? Are there any better alternatives that should be considered?

b) Are the appropriate indicators included in the dashboard of macro-indicators? Are there any alternatives that should be considered?

c) Are the appropriate indicators included in the third tier of thematic indicators? Are there any other indicators that should be considered?

d) Are the appropriate indicators included in the Scoreboard? Are there any other indicators that should be considered?

3) Which indicators would be best suited for potentially setting targets, by 2013 and for the future?

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1. Introduction

The purpose of this paper and its annexes is to inform stakeholders about the options chosen and the analysis undertaken by the Commission so far on indicators for resource efficiency. It builds on the discussion of possible indicators in European's Commission's Roadmap to a Resource Efficient Europe[4] (henceforth 'Roadmap'). and Annex 6 of its accompanying Staff Working paper[5]. A first draft Scoreboard (Annex 2) provides a visual presentation of how EU as a whole and Member States score against resource efficiency issues. It constitutes an intermediate step on the way to developing an agreed set of resource efficiency targets and indicators by 2013.

1.1. The resource efficiency context

Resource efficiency means using the Earth's limited resources in a sustainable manner. We depend on natural resources like metals, minerals, fuels, water, land, timber, fertile soil, clean air and biodiversity for our survival, and they all constitute vital inputs that keep our economy functioning. The Roadmap set out a vision for 2050 in which the EU's economy uses resources in a sustainable way and minimises their impacts on the environment.

Using resources more efficiently has clear economic benefits for companies: it improves productivity, reduces costs and enhances competitiveness, creating employment opportunities. The less firms and consumers are dependent on the availability of scarce resources, the less vulnerable they are to supply constraints and volatile market prices. There are also many growth and employment opportunities in the provision of green technologies and services, in renewable energy provision, eco-industries and recycling, for example. Resource efficiency will benefit other issues as well: wiser use of resources reduces greenhouse gas emissions and many other environmental and health problems.

Under the Europe 2020 Strategy, the EU's growth strategy for a smart, inclusive and sustainable economy, the Flagship Initiative for a resource-efficient Europe[6] points the way towards sustainable growth and supports a shift towards a resource-efficient, low-carbon economy. The Roadmap is one of the main building blocks of this Flagship Initiative.

The Roadmap sets out a framework in which future actions can be designed and implemented coherently. It outlines a vision for the structural and technological change needed up to 2050, with milestones to be reached by 2020 (Annex 1). These milestones illustrate what will be needed to put Europe on a path to resource efficient and sustainable growth.

The Commission is committed to discussing indicators and targets by the end of 2013. Robust and easily understandable indicators will be necessary to provide signals and measure progress in improving resource efficiency.

1.2. The consultation process

The purpose of the consultation process is to collect a wide range of options and ideas on how we can best measure, monitor and communicate resource efficiency, i.e. the interlinkages between the economy and the environment.

[4] COM (2011) 571, 'Roadmap to a Resource Efficient Europe' http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf
[5] http://ec.europa.eu/environment/resource_efficiency/targets_indicators/roadmap/index_en.htm
[6] http://ec.europa.eu/resource-efficient-europe/

To start the debate, the Commission has set up a draft Scoreboard (Annex2) with graphs for Member States and the EU-27, and is formally inviting comments from stakeholders.

Other fora contribute to the gathering of option and ideas:

- The European Resource Efficiency Platform (EREP) bringing together a high level group of leading figures from a wide range of stakeholders.
- The Online Resource Efficiency Platform (OREP) will be the home base for the resource efficiency implementation process allowing all stakeholders to engage in the debate[7].
- Sector-specific dialogues may be organised, as appropriate.

2. Developing a set of indicators to monitor resource efficiency policies

2.1. The Roadmap's mandate

In the Roadmap, the Commission proposed a new pathway to action on resource efficiency, with a process involving all key stakeholders, to discuss indicators and targets by 2013.

In particular the Commission stated its intention[8] to:

- *"Continue work on indicators, including the quality of the data, taking stock of existing assessment frameworks, such as iGrowGreen[9], with a view to inclusion in the mid-term review of the Europe 2020 strategy (2013);*
- *Propose a new lead indicator on natural capital and environmental impacts of resource use (end of 2013);"*

The Roadmap set out the following points:

1. The need to gather consensus on a set of indicators and targets to measure progress to a more resource efficient Europe:

   "Important progress is already being made to integrate environmental economic and social accounting systems, but there are several competing ideas on what indicators need to be used, improved or developed to guide better policy or investment decisions. Such indicators will need to be robust, easily understandable and widely accepted in order to continuously measure progress in improving resource efficiency. This is why the Commission proposes to engage with all key stakeholders to develop such indicators and potential targets."

2. The urgency to start the process with a lead indicator, even if it does not necessarily account for all aspects of resource efficiency:

   "However, recognizing the need to start measuring progress immediately, the Commission proposes using, as a provisional lead indicator, resource productivity, measured by the ratio of GDP to Domestic Material Consumption (expressed in Euro/tonne). A higher ratio would indicate better performance, with growth consuming relatively fewer resources. This, however, only captures the material resources aspects and does not deal with other resources or the potential shift of burden across countries."

[7] http://ec.europa.eu/environment/resource_efficiency/index_en.htm
[8] COM (2011) 571, Roadmap to a Resource Efficient Europe p.21
[9] http://ec.europa.eu/economy_finance/db_indicators/igrowgreen/index_en.htm

3. The need to complement the picture given by this indicator by a broader set of indicators:

   "Because this provisional lead indicator only gives a partial picture, it should be complemented by a 'dashboard' of indicators on water, land, materials and carbon indicators that measure environmental impacts and our natural capital or ecosystems as well as seeking to take into account the global aspects of EU consumption. On a third level, thematic indicators will be used to monitor progress towards existing targets in other sectors, as detailed in the Staff Working Paper accompanying this Roadmap."

4. Finally the Commission set itself a milestone:

   "By 2020 stakeholders at all levels will be mobilised to ensure that policy, financing, investment, research and innovation are coherent and mutually reinforcing. Ambitious resource efficiency targets and robust, timely indicators will guide public and private decision-makers in the transformation of the economy towards greater resource efficiency."

2.2. The purpose

The set of resource efficiency indicators would be used to:

1. **Measure the general progress** towards a resource efficient, low-carbon economy to guide public and private decision-makers and monitor the implementation of the milestones of the Roadmap (see Annex 1 for a complete list). The indicators should help communicate this link to assist in comparing and benchmarking Member States' performance.

2. **Allow for an informed discussion of whether targets can be set** in the context of resource efficiency. If yes potential targets would need to be monitored and progress verified and measured where there is a performance gap.

3. **Communicate the importance of the link between resources and the economy**. If we use scarce resources better then we can drive down costs, improve productivity, and improve Europe's competitiveness at the same time as improving the environment.

It reflects the following set of issues:

a. Natural capital base: what resources are available and their location; how much resources and services ecosystems can sustainably deliver; what effects particular pollutants have on these delivery mechanisms; and how one could offset the loss of depletable resources by substitution through investing in other forms of (natural) capital.

b. Production and consumption perspective: given that primary resource use is often outsourced to other countries, it is important that resource efficiency indicators provide a complete picture of resource use within the EU economy and the impacts this has inside and outside the EU[10].

[10] The production or territory perspective covers resources directly used for domestic production and consumption activities. This includes domestically extracted resources plus direct imports and exports which actually cross the border. The consumption or global perspective includes all resources embodied in internationally-traded products, and is better suited to monitoring the total global resource demand associated with European production and consumption, including resources used outside the EU borders to produce imported goods.

c. Growth and competitiveness: using fewer resources reduces costs and decreases the exposure to increasing resource prices and their volatility. Economic indicators are needed to document the link between resource efficiency and growth and competitiveness.

d. Risks and sustainability thresholds: the economy's reliance on material imports makes it vulnerable to both price and supply shocks. Furthermore, there are a number of planetary boundaries, that, if crossed, would lead to significant environmental damage affecting society and growth. Both economic and environmental resilience needs to be monitored.

A scoreboard, i.e. a set of indicators for resource efficiency for which data is readily available, is needed to monitor progress and to allow for benchmarking and comparison between Member States.

2.3. Indicator selection criteria

The indicators proposed are assessed using the following criteria drawn from the RACER methodology[11]:

- **Relevance** – i.e. closely linked to the objectives to be reached;
- **Acceptability** – e.g. by staff and stakeholders;
- **Credibility** for non experts, unambiguous and easy to interpret;
- **Easiness** to compute: based on available data or data collection possible at low cost;
- **Robustness** – They should not be susceptible to manipulation.

Additional criteria are taken into account to make the indicators suitable for use within the context of the EU political process:

- **Timeliness**: data should be recent to be relevant for policymakers.
- **Suitability for policy making:** the indicators should allow as well as possible for a monitoring of progress towards the milestones set out in the Roadmap.
- **Consistency:** the indicators suggested for the Scoreboard should be consistent in terms of boundary setting and accounting principles where possible. They should thus preferably have a strong link to the statistical system and integrated economic-environmental accounting frameworks such as SEEA.
- **Coverage:** the majority of indicators should be available for most EU-27 Member States.

Finally, the final set of indicators will have to be assessed as a package against these criteria. This means that even though some indicators score poorly on one specific criterion (e.g. data availability for all MS) they may still be included because they complement the other indicators on other criteria.

3. The different layers of indicators

The Roadmap proposed a three-layered pyramid structure comprising:

[11] RACER is an evaluation framework applied to assess the value of scientific tools for use in policy making. RACER stands for relevant, accepted, credible, easy and robust:

1) One **lead indicator** on material use,
2) A **dashboard** of macro-indicators on water, land and carbon,
3) A base of **theme specific indicators**.

This approach offers the advantage of having a complete set of indicators which covers a variety of issues, while at the same time presenting a limited set of encompassing and communicative macro-indicators.

As a lead indicator, the Commission proposed to continue to provisionally use 'resource productivity', measured by GDP divided by Domestic Material Consumption (euro/tonne), in order to have one highly visible indicator that links resource use to economic activity.

Because the lead indicator only covers material resources and has a national production perspective it is complemented with a concise dashboard of macro consumption and production indicators on water, land and carbon. This dashboard of indicators – in conjunction with the lead indicator – has the advantage that it focuses on clear changes or flows of main resources. As such it can be easily understood, measured and communicated.

Finally, to measure performance on the actions and milestones proposed in the Roadmap the Commission proposed a wider range of thematic indicators. Here the approach was to limit as far as possible the number of indicators to one relevant indicator per theme.

This chapter considers the main 'issues' in the choice of indicators. It is structured according to the three-tiered approach that was used in the Roadmap – going through each tier in turn.

3.1. First tier / the lead indicator: focus on material productivity

The Commission took the view that the most sensible approach for a lead indicator was that it should reflect material consumption while being related to the economic and social agenda.

In this context, it proposed a provisional lead indicator, resource productivity, measured by the ratio of GDP to Domestic Material Consumption, (expressed in Euro/tonne). A higher ratio would indicate better performance.

3.1.1. GDP

Gross domestic product (GDP) is the most frequently used measure for the overall size of an economy. However, GDP, as a measure of monetary values, does not cover non-market goods and services, it focuses on current economic activities rather than on the developments in natural, social and economic assets important from a longer term perspective, and it has no concern for inequality.

Despite all its limitations, GDP is still considered as the best available indicator accounting for the output of economic activity and ultimately wealth and jobs. The Commission is working under its “GDP and Beyond” initiative towards a more comprehensive measure of prosperity or wealth that might be used in the long-term.

3.1.2. Domestic Material Consumption (DMC)

DMC is taken from the set of Material Flow Accounting (MFA) indicators (Annex 3 provides a summary of the principles guiding MFA). It measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the

domestic territory, plus all physical imports minus all physical exports. The DMC indicator provides an assessment of the absolute level of the use of resources, and allows distinguishing consumption driven by domestic demand from consumption driven by the export market.

DMC is relatively widely available (in terms of coverage and time lag), and relatively robust. It offers the opportunity to relate an important part of the resource input into the economic production process to the output of economic activity. It does not allow, however to account for the flows required upstream along the production chain, accounting for imports and exports.

It is recognised, therefore, that over time a better candidate than DMC could be found. For this purpose the Commission estimates that monitoring material use in Raw Material Equivalents would be appropriate as is done for the Raw Material Consumption indicator (RMC). Another possibility to explore would be substituting DMC with a composite resource index taking into account the differences between resources and their environmental impact.

3.2. Second tier: focus on resource use and its environmental impacts

One single indicator is clearly unable to illustrate the complexity of resource use impacts and their interrelations. Therefore it was decided for the Roadmap to use a dashboard of indicators to monitor a wider spectrum of resource efficiency issues.

3.2.1. The dashboard: carbon, land and water

The Commission intends to use, improve or develop the following concrete indicators:

	Production / territory perspective	*Consumption / global supply chain perspective*
Land	Artificial land or built-up area (km²) – available with restrictions in time series	Indirect land use / embodied land for agricultural and forestry products (km²) – to be developed
Water	Water exploitation index[12] (WEI, %) – available with restrictions on completeness of data and regional/temporal resolution (river basin/intra-annual variations)	Water footprint – to be updated and improved or Embodied water – to be developed
Carbon	GHG emissions (t) – available	Carbon footprint – estimates available from scientific sources

The lead indicator and the dashboard focus on stocks or flows of main resources: materials land, water and carbon. This can be easily understood, measured and communicated. Both *production / territory perspective* as the c*onsumption / global supply chain perspective* are needed for analysing countries' use of resources and its environmental impact.

3.2.2. Further developments

The Commission has been carrying out work in order to explore complements and/or alternatives to the dashboard.

[12] This indicator has limitations; e.g. it aggregates different water resources, it does not take into account the nature of the water use after abstraction, the commonly used threshold values are under discussion. The Commission is exploring alternatives, which are however not yet fully available. Awaiting improvements, the WEI will continue to be use.

In particular the possibility to map indicators along the two dimensions of resource use and environmental impact was investigated in a study[13]. The study analysed several existing indicators that track the different types of resource flows in the economy, such as materials (abiotic and biotic), energy, water and land use.

It proposes an indicator basket consisting of two modules:

- **Module 1: Resource use indicators** are closely related to the drivers of resource use in the socio-economic system, monitoring e.g. material consumption or energy use of a country or the EU. Resource use indicators are needed for designing and monitoring measures to achieve reduction of environmental impacts. Addressing issues such as resource scarcities, access to resources, import dependencies and increased competitiveness driven by improved resource productivity require measuring Europe's resource use in absolute physical amounts. Also issues of international distribution and access to different types of natural resources can only be addressed with indicators in absolute amounts.
- **Module 2: Environmental impact indicators** would identify the increase or reduction in negative environmental impacts associated with our resource use (including issues such as climate change, ecosystem quality and biodiversity, toxic impacts on humans and ecosystems, etc.). The environmental impact-oriented indicators have a stronger link to the state of the environment.

Each module would provide a domestic and a global perspective.

- Indicators focused on **domestic resource use** comprise all resources that are directly used for domestic production and consumption activities. Thus they include domestically extracted resources plus direct imports and exports that actually cross the country border (in the case of land use, this category comprises only domestic land use, as land does not physically cross borders).

- Indicators focused on **global resource demand** additionally include resources embodied in internationally-traded products[14]. Those indicators are therefore suitable to monitor the total global resource demand associated with European production and consumption, including resources used outside the EU borders to produce imported goods. Those indicators with a global scope are in line with EU policy documents, which argue for applying a **life-cycle perspective** in environmental policy, in order to reflect possible outsourcing of environmental burden from the EU to other regions in the world.

[13] BIO IS (2012) 'Assessment of resource efficiency indicators and targets' http://ec.europa.eu/environment/enveco/resource_efficiency/pdf/report.pdf

[14] Those resources are also called "indirect", "virtual" or "hidden" resource flows in the literature.

The indicators can be mapped as follows:

	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	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***

Note: *short-term proxy for medium term desired indicator

This table provides a comprehensive description of the various aspects of resource efficiency. A number of the indicators foreseen are not available. Further research would be needed to assess the feasibility of developing such indicators.

3.3. Third tier / thematic indicators: monitoring policy effectiveness

The main objective of the third tier of the pyramid is to cover the key thematic areas and the related milestones of the Roadmap. The intention is to encompass the whole Roadmap with as few indicators as possible, while avoiding where possible to refer to anecdotal evidence.

TABLE 3: Key areas that need to be covered by the thematic indicators

Transforming the economy	Changing consumption patterns
	Boosting efficient production
	Turning waste into a resource
	Supporting research and innovation
	Phasing out inefficient subsidies
	Getting the prices right
Natural capital and ecosystem services	Ecosystem services
	Biodiversity
	Minerals and metals
	Water
	Safeguarding clear air
	Land and soils
	Marine resources
Key sectors	Addressing food

	Improving buildings
	Ensuring efficient mobility
Governance and monitoring	Financing resource efficient innovation and investment

The Roadmap included almost 40 potential indicators for this third layer. However, for some indicators data are not available, have not the required quality, or do not currently meet the RACER criteria well enough to be included. For example, an indicator on the percentage of green public procurement is proposed, but such an indicator is not yet available with good enough quality to justify inclusion in the Scoreboard.

4. The Scoreboard

To spur debate, the Commission has published a first draft Scoreboard with 19 indicators. These include the lead indicator (GDP/DMC), as well as indicators from the Roadmap along with a number of thematic indicators.

It builds on existing indicator sets such as the Sustainable Development Index (SDI) developed by EUROSTAT[15] or the Green Growth Initiative of the OECD. It goes beyond traditional environmental indicators to focus more on the link between natural resources and the economy.

The 19 indicators included in the Scoreboard are shown in the table below. As stated above, it relies on immediately existing data in order to be operational.

Further developments and refinements will have to take place however, for the sSoreboard to fulfil its role. It has in particular to be better related to the milestones of the Roadmap. It also has to convey a clear narrative along the three main agendas of resource efficiency, i.e. the resource agenda, the environment agenda and the economy agenda.

The number of components of the final set of resource efficiency indicators is therefore likely to grow, while remaining limited, as new indicators become available.

Point 5.2 below provides a more detailed description of possible topics for further development.

[15] http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators

TABLE 1: SCOREBOARD ON RESOURCE EFFICIENCY

Theme/subtheme/indicator	Data source	Reference (latest) year
LEAD INDICATOR		
Resources		
1.1 Resource productivity (GDP/DMC)	Eurostat	2009
DASHBOARD INDICATORS		
Land		
1.2 Artificial land or built-up area	Eurostat	2009
Water		
1.3 Water Exploitation Index	EEA	2007
Carbon		
1.4 GHG emissions	EEA	2010
THEMATIC INDICATORS		
TRANSFORMING THE ECONOMY		
Turning waste into a resource		
2.1.1 Total waste generation	Eurostat	2008
2.1.2 Municipal waste	Eurostat	2010
2.1.3 Recycling rate (of municipal waste)	Eurostat	2010
2.1.4 Landfill rate (of municipal waste)	Eurostat	2010
Supporting research and innovation		
2.2.1 Eco-innovation index	Eco-innovation Observatory	2011
Getting the prices right		
2.3.1 Environmental taxes	Eurostat	2009
NATURAL CAPITAL AND ECOSYSTEM SERVICES		
Safeguarding clean air		
3.1.1 Concentrations of particulate matters	EEA	2009
3.1.2 EU population in areas with PM concentrations exceeding daily limit values	EEA	2009
Land and soils		
3.2.1 Soil erosion by water	JRC	2012
3.2.2 Gross nutrient balance (nitrogen and phosphorus)	Eurostat	2008
Marine resources		
3.3.1 Fish catches from stocks outside the safe biological limits	ICES	2010
KEY SECTORS		
Addressing food		
4.1.1 Consumption of meat and dairy products per capita per year	PBL Netherlands Environmental Assessment Agency	2007
Improving buildings		
4.2.1 Energy consumption per m^2 for space heating	EEA and ODYSSEE MURE	2009
Ensuring efficient mobility		
4.3.1 Average CO2 emissions / km for new passenger cars	EEA	2010
4.3.2 Pollutant emissions from transport	EEA	2010

The indicators included in the draft Scoreboard closely match those that were presented in the Roadmap. Nevertheless there are some differences:

- Some of the indicators included in Annex 6 of the Roadmap could not be included in the draft Scoreboard because no sufficient data are available.
- In addition two new indicators, were introduced (Eco-Innovation Index and Gross nutrient balance), because they fill gaps related to important aspects of resource efficiency and they fulfil the criteria set out above.
- Finally, in order to allow for country comparisons, some indicators have been expressed in relative terms (per capita) or expressed differently to address some quality concerns (e.g. recycling and landfill as a share of municipal waste).

Table 2 below provides an overview of the differences (in italic) between Annex 6 of the Roadmap and the indicators presented in the draft Scoreboard. A more in depth discussion of these differences can be found in Annex 4.

TABLE 2: Comparison draft Scoreboard and Annex 6 of the Roadmap

Draft Scoreboard	**Annex 6 of the Roadmap**
Municipal waste generation	Total waste generation
Eco-Innovation Index	Not included
Gross nutrient balance (nitrogen and phosphorus)	Not included
GHG emissions *(per capita)*	GHG emissions
Recycling rate *of municipal waste*	Overall recycling rate
Landfill rate *of municipal waste*	Landfill rate
Fish *catches* from stocks outside the safe biological limits	Share of fish and shellfish populations within safe biological limits

5. Way forward

Indicators are not always available, and in particular indicators are stronger on environmental and resource use issues than on resource efficiency issues. Given the approach and requirements set out above, some gaps remain in the development of a set of resource efficiency indicators. This section sets out the main areas in which the Commission or its partners are undertaking work and other areas where further development is desirable.

5.1. Indicator development

5.1.1. Land and ecosystem accounting

The EEA is developing ecosystem accounts as part of the System of Economic-Environmental Accounts, which aims supplementing the UN System of National Accounts with information on the environment and natural capital. The purpose is to broaden the scope of the variables taken into account in policy making in order to improve understanding of the interdependence and interactions between the economy and the environment.

Ecosystem Accounts are tools that we can use to describe systematically how the quantity and quality of ecosystems, and the ecological structures and processes that underpin them, change over time. Ultimately they can help us understand the costs of such change to people, either in monetary terms or in terms of risks to their health or livelihood.

5.1.2. Environmental footprint of products

The European Commission is working towards the development of a harmonised methodology for the calculation of the environmental footprint of products (including carbon footprint). A technical guide is now being tested using a limited number of pilot studies representative of a wide variety of goods and services. The sectors covered through the testing include: agriculture, retail, construction, chemicals, ICT, food, manufacturing (footwear, televisions, paper). Parallel work on the methodological guide on environmental footprinting of organisations is ongoing.

5.1.3. Composite index on environmental pressures

The composite index on environmental pressures for the European Union is an initiative announced in the European Commission's "GDP and beyond – Measuring progress in a changing world" Communication[16]. The Communication expressed the need for an environmental index that can be used in policy-debates alongside GDP and social indicators, so as to indicate whether progress is being made on environmental goals in line with the demands from today's society. The goal of the composite index is to calculate the composite index of environmental pressures for the EU as a whole, for all 27 EU Member States (MS) and if possible also for the 3 Candidate Countries, using data series from 1995 to most recent year available, ideally the year preceding the current year.

5.1.4. Indicator on environmental impacts of resource use

The European Commission is developing an indicator on the environmental impacts of resource use, which will take a life cycle perspective[17]. A first pilot study for Germany is ready. The analysis will now be carried out for some other Members States.

5.2. Developing and Refining the Scoreboard

While being kept to a limited number of indicators, the scoreboard might be differently organised in order to more easily convey a storyline

In particular, a number of indicators might be refined (such as the land, water or energy consumption indicators) in order to be better adapted to the specificities of various countries). Further disaggregation will be looked into in order to better understand the links between resource efficiency and competitiveness and take into account territorial specificities.

Developing new indicators will also be considered, such as an indicator of energy and materials-intensive sectors or of environmental harmful subsidies. Similarly, providing a more complete perspective of efficient mobility could be looked into.

Time series will be included where available in order to be able to assess the performance of indicators over time and allow for the setting of targets individualised to specific countries.

5.3. Development of nowcasting and early estimates methods

Monitoring progress and ensuring the active involvement of EU countries are key elements of the Europe 2020 Strategy, of which the Resource Efficiency Flagships forms part. This monitoring is done through the European Semester, an annual cycle of macro-economic, budgetary and structural policy coordination. Every European Semester starts in January,

[16] (COM(2009) 433)
[17] See also http://lct.jrc.ec.europa.eu/assessment

when the Commission issues its Annual Growth Survey. It is finalized every year by the end of June or in early July, when the Council formally adopts the country-specific recommendations.

The European Semester is a clear example of a case where timely annual data are of essential importance. Most environmental and resource related indicators however currently have a time lag of 2 or 3 years between the reporting period and the publication of the data (T-2 or T-3). To remedy this issue the Commission has recently launched a study to investigate and develop 'early estimates' (T-1, based on early analysis of data concerning the previous period of time) and 'nowcasts' (T-0, estimates for the current period, based on statistical models).

5.4. Better documenting the link between the environment and the economy

Using fewer resources reduces costs and decreases the exposure to increasing resource prices and their volatility. Documenting the link between resource efficiency and growth and competitiveness is therefore needed. One possible approach is to use the economic growth accounting framework, which identifies the contribution of different measurable inputs factors (usually capital and labour) to growth along with the residual representing technological progress (Total Factor Productivity or TFP). However, separating out the contribution of resources in TFP is clearly challenging in practice.

Disaggregating data along sectors might also provide clearer insights into competitiveness issues.

5.5. Monitoring risks

Resource efficiency helps anticipate future risks related to the supply of resources and related to sustainability thresholds that could be crossed. Global demand for resources is increasing, as the world population grows and becomes richer, bringing tensions to Europe's dependency on resource imports. This causes higher and more volatile prices. The result is that the European economy faces a risk associated with resource use. Therefore both economic and environmental resilience needs to be monitored.

5.6. Short and long term developments

Aside the need for indicators to be developed latest by 2013 which could then be used to monitor Member States for the European Semester, the Commission is also looking at longer term developments. These could include the elaboration of complete new indicators or the gathering of additional data.

6. Invitation to comment

This paper has set out background information and the main issues in the design of a set of resource efficiency indicators. Whilst debate on the set of indicators will continue into 2013, stakeholders are already invited to respond to the following questions by 22 October 2012 via DG Environment's consultation web page. This will allow for the set of indicators to be revised further, and will feed into later rounds of discussion.

Questions

1) What are the key issues that need to be addressed by indicators to support resource policy?

2) Are there other indicators that we should be using to monitor the economic and environmental impacts of resource efficiency policies by 2013 and for the future? More specifically:

a) Is the proposed lead indicator, GDP/DMC an appropriate indicator to measure resource efficiency? Are there any better alternatives that should be considered?

b) Are the appropriate indicators included in the dashboard of macro-indicators? Are there any alternatives that should be considered?

c) Are the appropriate indicators included in the third tier of thematic indicators? Are there any other indicators that should be considered?

d) Are the appropriate indicators included in the Scoreboard? Are there any other indicators that should be considered?

3) Which indicators would be best suited for potentially setting targets, by 2013 and for the future?

Annexes to the consultation paper

Overview

Annex 1: Roadmap for Resource Efficient Europe: Vision & milestones

Annex 2: EU draft Scoreboard on Resource Efficiency

Annex 3: Principles Guiding the Material Flow Accounting (MFA) Methodology

Annex 4: Comparison between Annex 6 of the Roadmap and the indicators presented in the Scoreboard

Annex 1:

Roadmap for a Resource Efficient Europe: Vision & milestones

A. Vision

By 2050 the EU's economy has grown in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation. Our economy is competitive, inclusive and provides a high standard of living with much lower environmental impacts. All resources are sustainably managed, from raw materials to energy, water, air, land and soil. Climate change milestones have been reached, while biodiversity and the ecosystem services it underpins have been protected, valued and substantially restored.

B. Milestones

Theme	Section	Milestone
1. Consumption	3. Transforming the economy	By 2020, citizens and public authorities have the right incentives to choose the most resource efficient products and services, through appropriate price signals and clear environmental information. Their purchasing choices will stimulate companies to innovate and to supply more resource efficient goods and services. Minimum environmental performance standards are set to remove the least resource efficient and most polluting products from the market. Consumer demand is high for more sustainable products and services.
2. Production	3. Transforming the economy	By 2020, market and policy incentives that reward business investments in efficiency are in place. These incentives have stimulated new innovations in resource efficient production methods that are widely used. All companies, and their investors, can measure and benchmark their lifecycle resource efficiency. Economic growth and wellbeing is decoupled from resource inputs and come primarily from increases in the value of products and associated services.
3. Waste as a resource	3. Transforming the economy	By 2020, waste is managed as a resource. Waste generated per capita is in absolute decline. Recycling and re-use of waste are economically attractive options for public and private actors due to widespread separate collection and the development of functional markets for secondary raw materials. More materials, including materials having a significant impact on the environment and critical raw materials, are recycled. Waste legislation is fully implemented. Illegal shipments of waste have been eradicated. Energy recovery is limited to non recyclable materials, landfilling is virtually eliminated and high quality recycling is ensured.
4. Supporting research and innovation	3. Transforming the economy	By 2020, scientific breakthroughs and sustained innovation efforts have dramatically improved how we understand, manage, reduce the use, reuse, recycle, substitute and safeguard and value resources. This has been made possible by substantial increases in investment, coherence in addressing the societal challenge of resource efficiency, climate change and resilience, and in gains from smart specialization and cooperation within the European research area.
5. EHS	3. Transforming the economy	By 2020 EHS will be phased out, with due regard to the impact on people in need.

Theme	Section	Milestone
6. Taxation	3. Transforming the economy	By 2020 a major shift from taxation of labour towards environmental taxation, including through regular adjustments in real rates, will lead to a substantial increase in the share of environmental taxes in public revenues, in line with the best practice of Member States
7. Ecosystem services	4. Natural capital and ecosystem services	By 2020 natural capital and ecosystem services will be properly valued and accounted for by public authorities and businesses.
8. Biodiversity	4. Natural capital and ecosystem services	By 2020 the loss of biodiversity in the EU and the degradation of ecosystem services will be halted and, as far as feasible, biodiversity will be restored.
9. Water	4. Natural capital and ecosystem services	By 2020, all WFD River Basin Management Plans (RBMPs) have long been implemented. Good status – quality, quantity and use - of waters was attained in all EU river basins in 2015. The impacts of droughts and floods are minimised, with adapted crops, increased water retention in soils and efficient irrigation. Alternative water supply options are only relied upon when all cheaper savings opportunities are taken. Water abstraction should stay below 20% of available renewable water resources.
10. Air	4. Natural capital and ecosystem services	By 2020, the EU's interim air quality standards will have been met, including in urban hot spots, and those standards will have been updated and additional measures defined to further close the gap to the ultimate goal of achieving levels of air quality that do not cause significant impacts on health and the environment.
11. Land use	4. Natural capital and ecosystem services	By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050; soil erosion is reduced and the soil organic matter increased, with remedial work on contaminated sites well underway.
12. Marine	4. Natural capital and ecosystem services	By 2020, good environmental status of all EU marine waters is achieved, and by 2015 fishing is within maximum sustainable yields.
13. Food waste	5. Key sectors	By 2020, incentives to healthier and more sustainable food production and consumption will be widespread and will have driven a 20% reduction in the food chain's resource inputs. Disposal of edible food waste should have been halved in the EU.
14. Buildings	5. Key sectors	By 2020 the renovation and construction of buildings and infrastructure will be made to high resource efficiency levels. The Life-cycle approach will be widely applied; all new buildings will be nearly zero-energy and highly material efficient, and policies for renovating the existing building stock will be in place so that it is cost-efficiently refurbished at a rate of 2% per year. 70% of non-hazardous construction and demolition waste will be recycled.
15. Mobility	5. Key sectors	By 2020 overall efficiency in the transport sector will deliver greater value with optimal use of resources like raw materials, energy, and land, and reduced impacts on climate change, air pollution, noise, health, accidents, biodiversity and ecosystem degradation. Transport will use less and cleaner energy, better exploit a modern infrastructure and reduce its negative impact on the environment and key natural assets like water, land and ecosystems. There will be on average a 1% yearly reduction, beginning in 2012, in transport GHG emissions.
16. New pathways	6. Governance and monitoring	By 2020 stakeholders at all levels will be mobilised to ensure that policy, financing, investment, research and innovation are coherent and mutually reinforcing. Ambitious resource efficiency targets and robust, timely indicators will guide public and private decision-makers in the transformation of the economy towards greater resource efficiency.

Theme	Section	Milestone
17. Internationally	6. Governance and monitoring	By 2020 resource efficiency will be a shared objective of the international community, and progress will have been made towards it based on the approaches agreed in Rio.
18. EU environmental measures	6. Governance and monitoring	By 2020 the benefits from EU environmental legislation will be fully delivered.

Annex 2: EU draft Scoreboard on Resource Efficiency

EU DRAFT SCOREBOARD ON RESOURCE EFFICIENCY

Assessing trends towards a Resource-efficient Europe

*******Version 31 May*******

Introduction

Natural resources underpin our economy and our quality of life. But global demand for resources is increasing, as the world population grows towards 9 billion people and becomes richer, putting more pressure on those resources. More demand means higher – and more volatile – prices along with riskier supply. Resources are thus becoming scarcer and more expensive.

Improving resource efficiency means producing more from less (i.e. making better use of our limited natural resources like metals, minerals, fuels, water, crops, fertile soil and clean air) and at the same time reducing the environmental impact of resource use.

Increasing resource efficiency is key to securing growth and jobs for Europe by decoupling economic growth from natural resource use. It will bring major economic opportunities, spur innovation, drive down costs and boost competitiveness.

What is the aim of having a scoreboard on resource efficiency?

The Resource Efficiency Scoreboard will be used to monitor the implementation of the Roadmap to Resource Efficient Europe[18], to communicate the importance of the link between resources and the economy, and to engage stakeholders.

How have the indicators in the scoreboard been selected?

For this scoreboard, a limited set of already available indicators was selected, covering as many as possible of the themes and subthemes identified in the Roadmap. It is a three tier system based on a **lead indicator**, a **dashboard** and **a set of theme specific indicators** (on "Transforming the economy", "Natural capital and ecosystems services" and "key sectors").

The scoreboard includes the most recent statistics from Eurostat, the European Environment Agency and other international recognised sources as available at the time of analysis. Some graphs show a ranking of the Member States, which may point to the best performing Member States and to those with particular challenges.

The climate change and energy indicators (i.e. GHG emissions, renewables share of final energy consumption and energy intensity) are also essential for measuring resource efficiency in the EU.

What next?

The scoreboard will evolve further by 2013 after the consultation of stakeholders.

[18] COM(2011) 571, http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf

TABLE 1 : SCOREBOARD ON RESOURCE EFFICIENCY

Theme/subtheme/indicator	Data source	Reference (latest) year
LEAD INDICATOR		
Resources		
1.1 Resource productivity (GDP/DMC)	Eurostat	2009
DASHBOARD INDICATORS		
Land		
1.2 Artificial land or built-up area	Eurostat	2009
Water		
1.3 Water Exploitation Index	EEA	2007
Carbon		
1.4 GHG emissions	EEA	2010
TRANSFORMING THE ECONOMY		
Turning waste into a resource		
2.1.1 Total waste generation	Eurostat	2008
2.1.2 Municipal waste	Eurostat	2010
2.1.3 Recycling rate (of municipal waste)	Eurostat	2010
2.1.4 Landfill rate (of municipal waste)	Eurostat	2010
Supporting research and innovation		
2.2.1 Eco-innovation index	Eco-innovation Observatory	2011
Getting the prices right		
2.3.1 Environmental taxes	Eurostat	2009
NATURAL CAPITAL AND ECOSYSTEM SERVICES		
Safeguarding clean air		
3.1.1 Concentrations of particulate matters	EEA	2009
3.1.2 EU population in areas with PM concentrations exceeding daily limit values	EEA	2009
Land and soils		
3.2.1 Soil erosion by water	JRC	2012
3.2.2 Gross nutrient balance (nitrogen and phosphorus)	Eurostat	2008
Marine resources		
3.3.1 Fish catches from stocks outside the safe biological limits	ICES	2010
KEY SECTORS		
Addressing food		
4.1.1 Consumption of meat and dairy products per capita per year	PBL Netherlands Environmental Assessment Agency	2007
Improving buildings		
4.2.1 Energy consumption per m^2 for space heating	EEA and ODYSSEE MURE	2009
Ensuring efficient mobility		
4.3.1 Average CO2 emissions / km for new passenger cars	EEA	2010
4.3.2 Pollutant emissions from transport	EEA	2010

TABLE 2 : COUNTRY ABBREVIATIONS

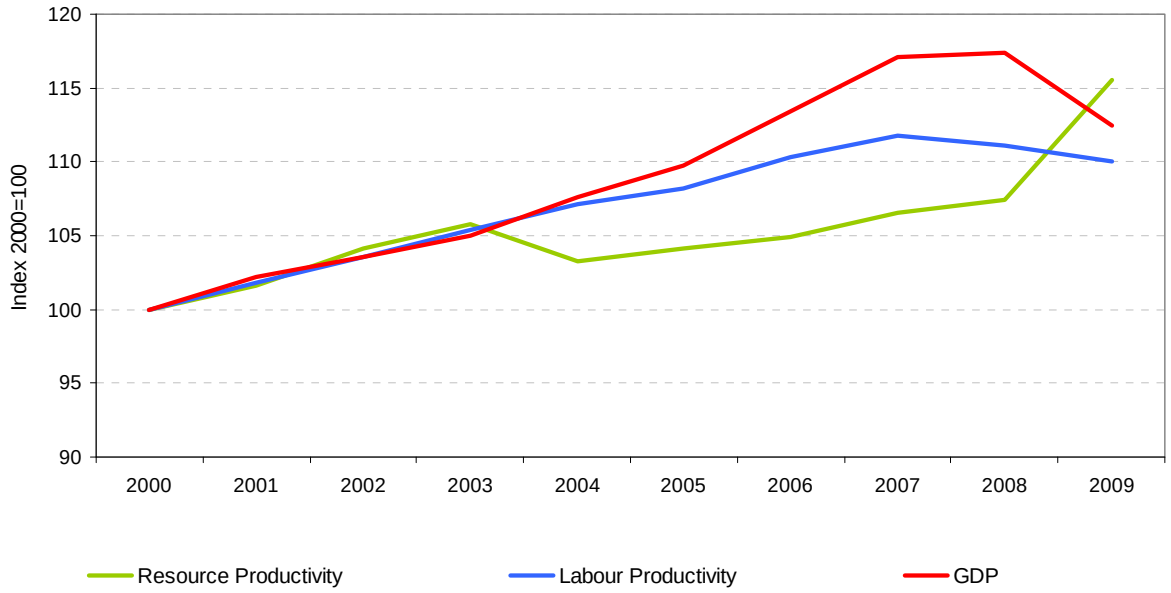
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
EU	European Union
FI	Finland
FR	France
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	The Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

EU European Union

1. Lead and dashboard indicators

1.1. Lead indicator for resources

1.1. Resource productivity, Labour productivity and GDP in the EU 2000-2009



Source: Eurostat, 2012

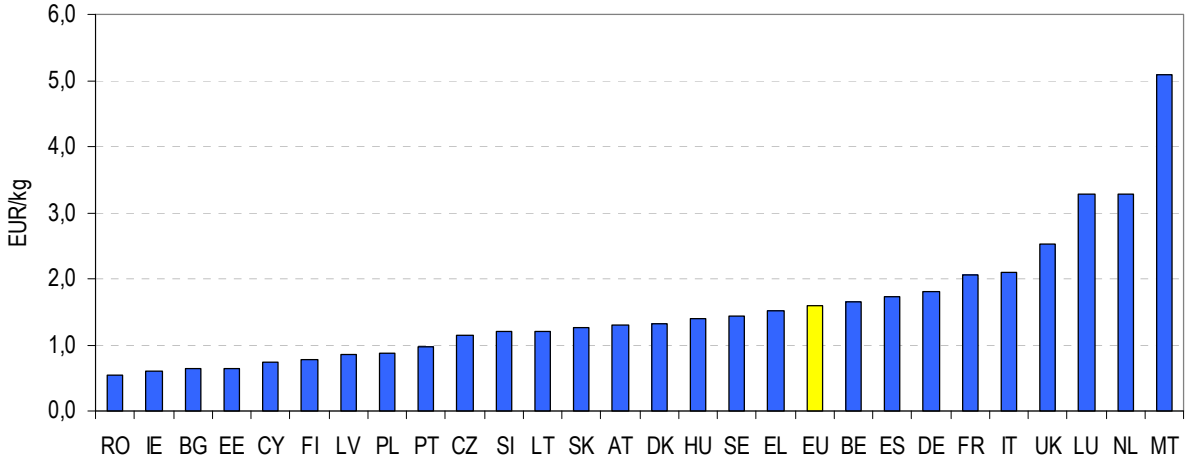
Resource Productivity – measured as Gross Domestic Product in market prices (GDP)[19] over Domestic Material Consumption (DMC) – relates an important part of the resource input into the economic production process to the output of economic activity.

Resource productivity of the EU economy has been increasing from 1.22 EUR/kg in 2000 to 1.41 EUR/kg in the year 2009. This corresponds to an average annual increase of about 1.5%, slightly above the growth rate of GDP (around 1.2%).

The pattern over time was characterised by up and downs, particularly because the last year of the reporting period has been a year of economic recession: DMC shrank by almost 12% between 2008 and 2009, i.e. dropping much more than GDP (which fell by 4% in the same period). In other words, there has been a decoupling of economic growth from material resource use domestically.

[19] GDP expressed as chain-linked volume, i.e. without inflation.

1.1. Resource productivity (GDP/DMC)
2009



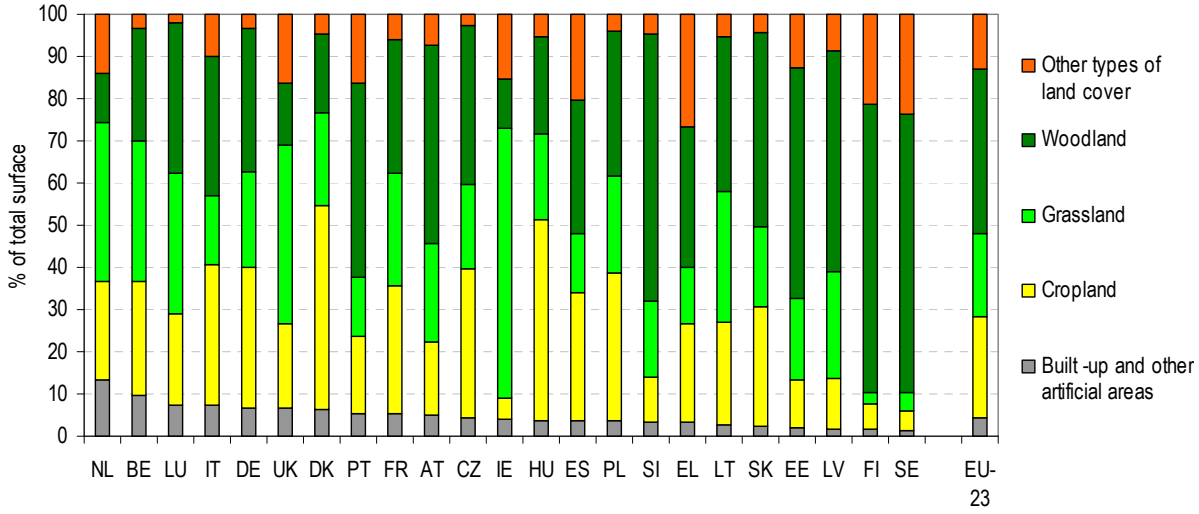
Source: Eurostat, 2012

The indicator shows significant variety between countries. Some Member States are much more resource efficient than others and this suggests there is scope for sharing best practices.

Malta has the best resource productivity as its economy is focusing on services. It imports mainly finished goods and very few bulk raw materials, therefore has a low DMC and a high resource efficiency indicator value.

1.2. Macro indicator on land

1.2. Artificial land or built-up area and other categories of land cover
2009

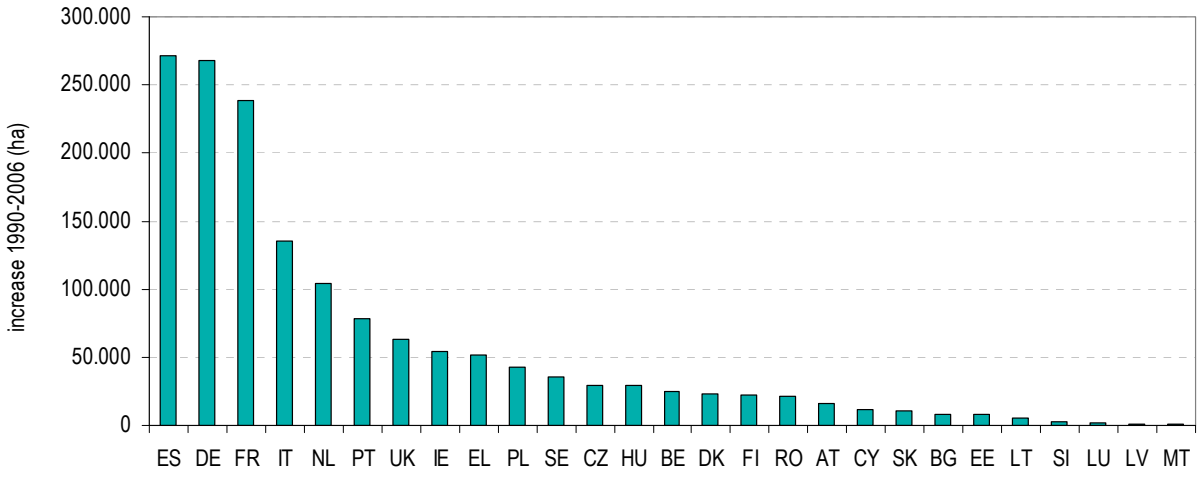


Source: Eurostat, LUCAS 2009 (survey not covering BG, CY, MT and RO).

Land is a finite resource and the way it is used is one of the principal drivers of environmental change. Land take by urban development and infrastructure presents a high risk of being irreversible. It consumes mostly agricultural land, and increases fragmentation of habitats and ecosystems that provide important services like regulation of the water balance and protection against floods, particularly if soil is highly sealed.

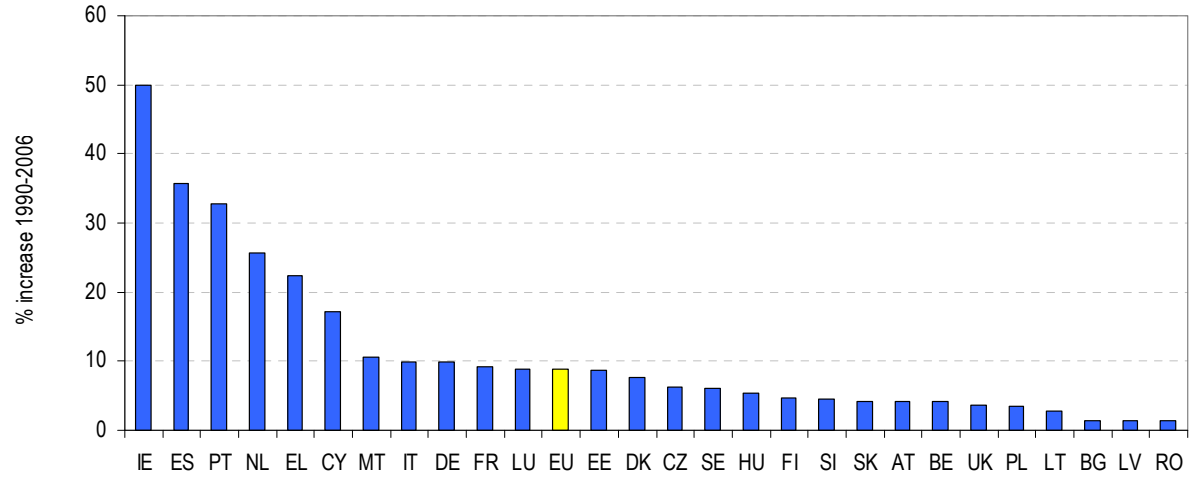
The indicator measures artificial land and other types of land cover over the total surface in the country. The Netherlands has the highest share of artificial land in the EU.

1.2. Increase of built up area 1990-2006



Source: Eurostat, CORINE 1990 and 2006

During 1990-2006 1.5 million hectares of land were converted to artificial land in the EU, equivalent to an area of 1.000 km^2 annually (an area larger than the city of Berlin). In absolute figures, the built up area increased by more than 200.000 hectares in Spain, Germany and France.

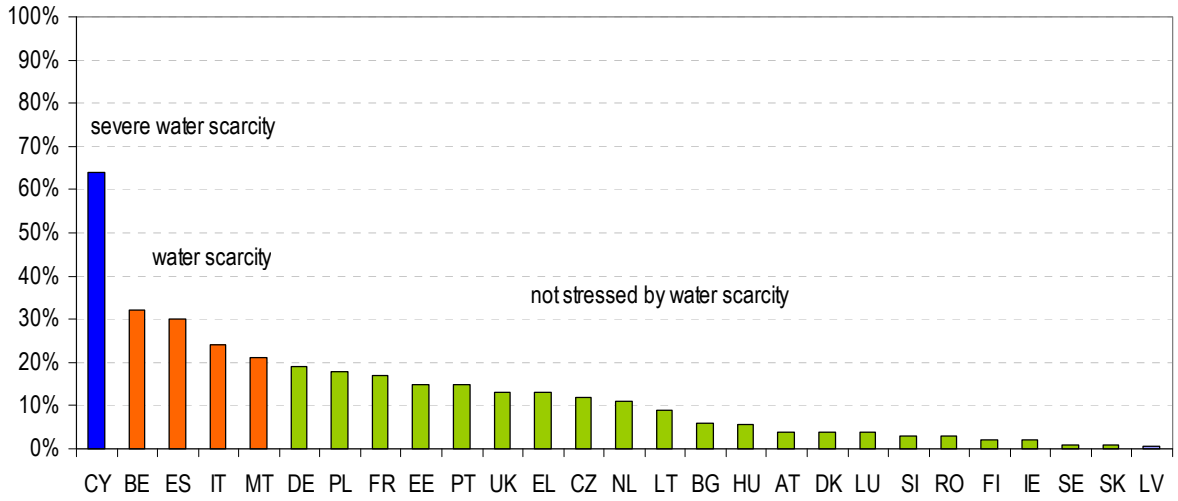


Source: Eurostat, CORINE 1990 and 2006

EU artificial land increased by almost 9% from 1990 to 2006. The rate of change is not the same across Member States: built up areas increased by 50% in Ireland and by more than 30% in Spain and Portugal, whilst it increased by less than 2% in Bulgaria, Latvia and Romania.

1.3. Macro indicator on water

1.3. Water exploitation index
2007



Source: EEA, 2011. EU is not shown as water scarcity is a regional problem.

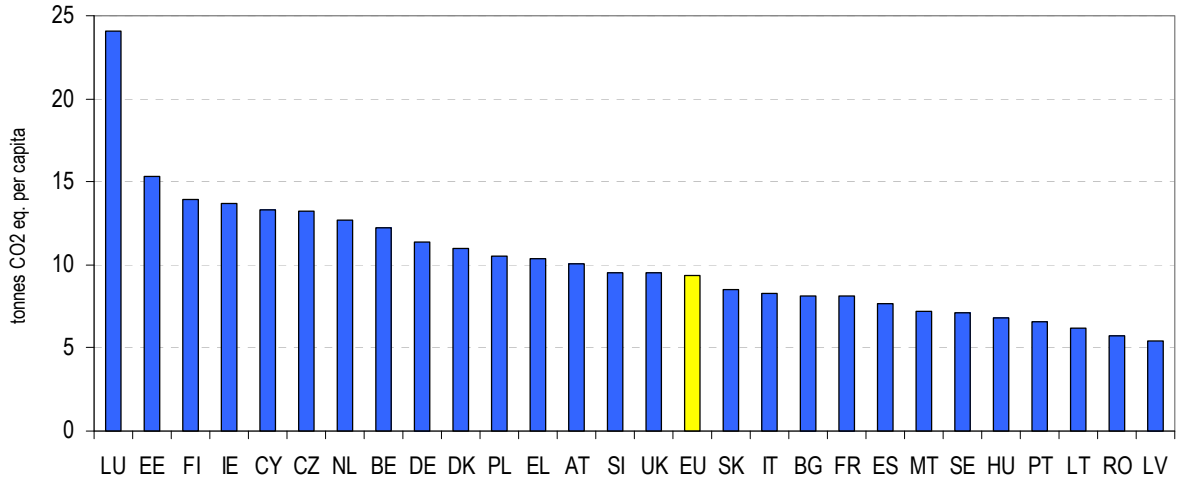
Water is a vital resource for human health and an essential input for agriculture, tourism, industry, transport and energy. Reduced water availability has a direct negative impact on citizens and economic sectors. The WEI identifies countries that have high demand in relation to their resources and therefore are prone to suffer water stress.

The index measures the annual total abstraction of fresh water in a country or region compared to the long term average fresh water resources. The warning threshold, which distinguishes a non-stressed from a water scarce region, is around 20%, with severe scarcity occurring where the WEI exceeds 40%.

Countries in the Mediterranean in particular face increasing demand for water while at the same time climate change is likely to reduce water availability. Water scarcity is a very serious problem for Cyprus, which suffered from a significant drought from 2004-2008 with the worst year being 2007/08 (only 54% of the average normal precipitation). Belgium has a very high WEI because of the significant use of water in its nuclear industry.

1.4. Macro indicator on carbon

1.4. GHG emissions
2010



Source: EEA, 2011.

The decarbonisation of the economy is essential to move to a resource efficient economy. The indicator measures total Kyoto green house gas emissions per capita in tonnes CO2 tonnes equivalent.

On average each EU citizen produced 9.4 tonnes CO2 eq. in 2010, but there are big differences among Member States.

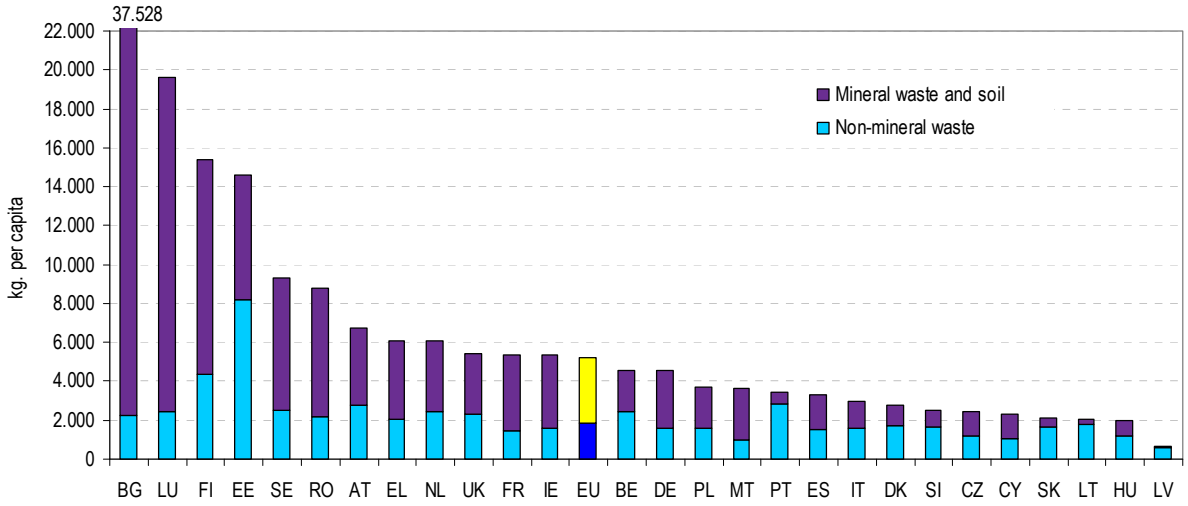
Luxembourg produced 24.1 tonnes CO2 eq. per capita, mainly due to its high transport emissions (transport accounts by around 50% of its GHG emissions against an EU average of 20%); they are mainly due to road fuels sold to non-residents, resulting from lower fuel prices, important cross-border workforce and Luxembourg specific location in Europe. At the other end, Latvia produced 5.4 tonnes CO2 eq. per capita (e.g. around four times less Luxembourg).

In 2010, EU-15 emissions were 11.0 % below base year levels, so better than the collective 8% Kyoto reduction target for the 2008–2012 period.

2. Transforming the economy

2.1. Turning waste into a resource

2.1.1. Total waste generation, 2008

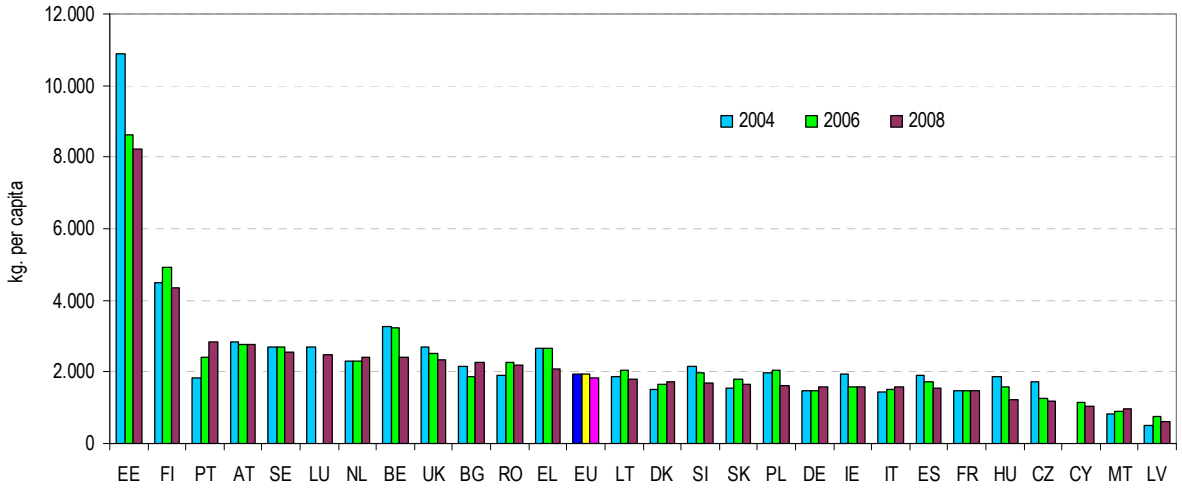


Source: Eurostat, 2011

Increasing waste prevention in line with the principle of the 'waste hierarchy'[20] will contribute directly to improving resource and material efficiency, decoupling economic growth from waste generation.

The indicator is defined as the total amount of waste generated per capita in a country. Total waste generated per capita varies considerably across countries, ranging from 660 kg per capita in Latvia up to 37,528 kg per capita in Bulgaria. The huge variation of total waste generated can be explained to a large extent by differences in the economic structure. Most waste generated in Bulgaria and Luxembourg comes from minerals and soil.

Non mineral waste generation, 2004, 2006, 2008



Source: Eurostat, 2011

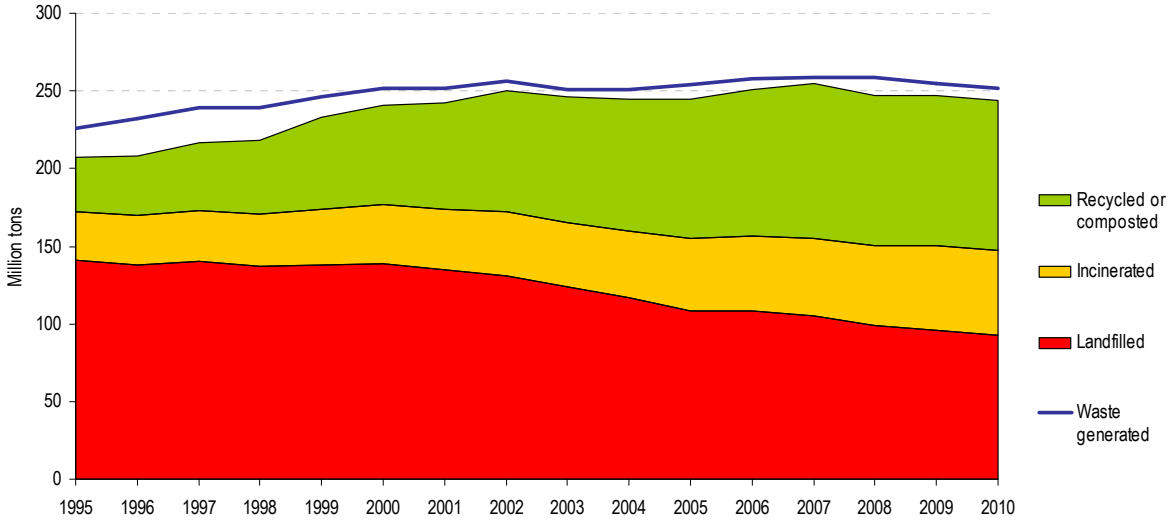
This indicator is defined as total waste generated in a country per inhabitant and year, excluding mineral waste, dredging spoils and contaminated soils. This exclusion enhances comparability across countries as mineral waste accounts for high quantities in some countries from economic activities such as mining and construction.

Non mineral waste generated has decreased in EU and in most Member States during the period 2004-2008. The high level of waste generated in Estonia is mainly due to large amounts of hazardous waste from the energy and the refinery sector, derived from the use of shale gas as the main source of energy production. In Finland, the high level of waste generated mainly comes from wood waste and from paper and forestry.

[20] EU waste management policy is based on a hierarchy of principles: the best being waste prevention, followed by re-use, recycling and other recovery, safely incineration, and disposal being the least favourable.

2.1.2. Municipal waste

Municipal waste generation and treatment in EU, 1995-2010

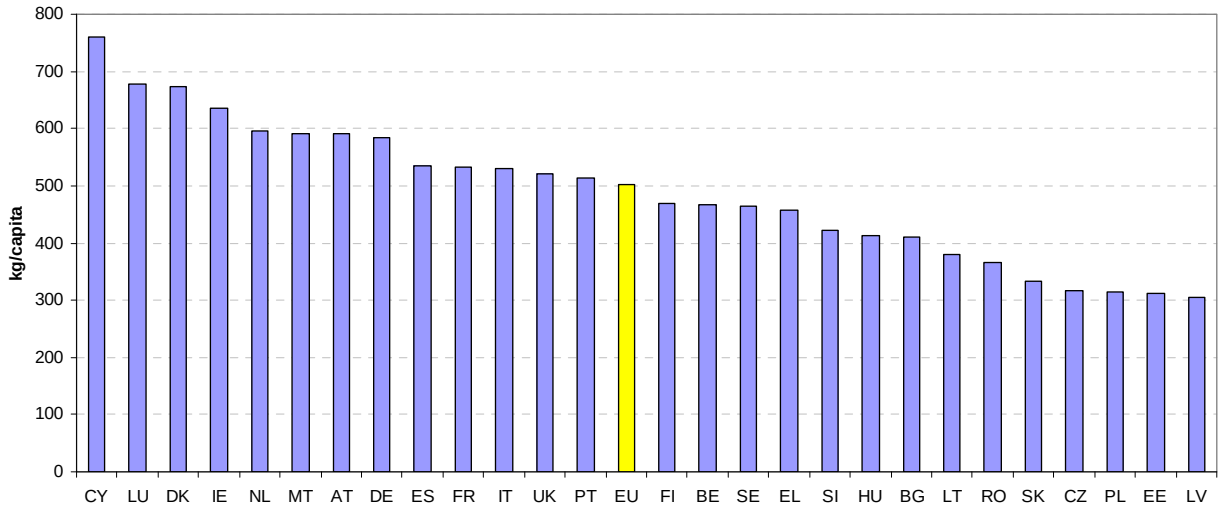


Source: Eurostat[21], 2012.

Municipal waste consists to a large extent of waste generated by households, but may also include similar waste generated by small businesses and public institutions and collected by the municipality. It represents around 10% of the total waste produced in the EU and is the only waste related indicator for which a long time series exists for the EU.

In 2010, the EU generated 252 million tons of municipal waste, which represents an increase of 11% compared to 1995. The EU is, however, moving towards a more sustainable waste management, as recycling (including composting) increased from 17% in 1995 to 40% in 2010 while landfilling decreased from 68% to 38%.

Municipal waste generation, 2010



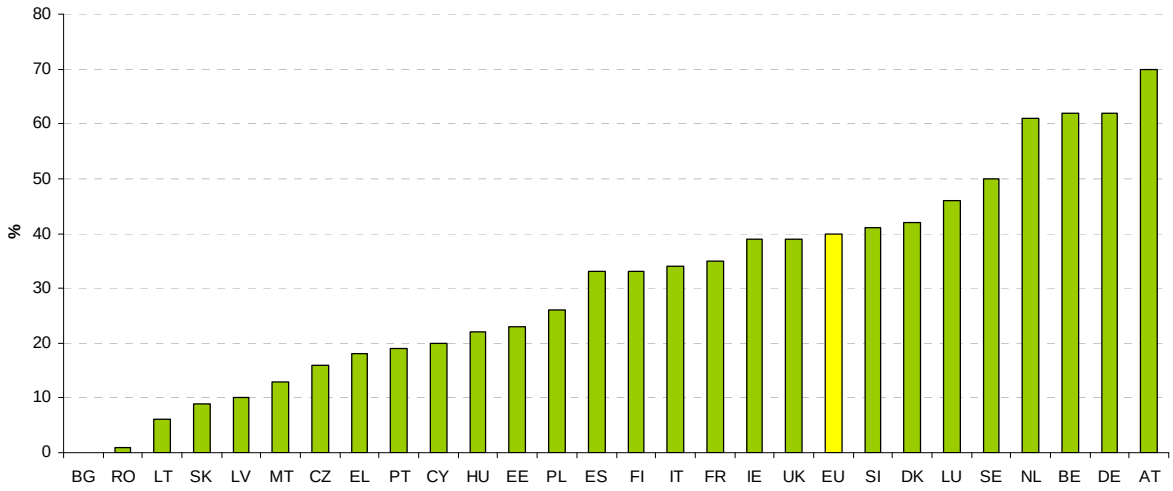
Source: Eurostat, 2012

On average every EU citizen produced 502 kg of municipal waste in 2010. The amount of municipal waste generated varies significantly across Member States, from more than

[21] The reported quantities of waste generated and treated (recycled or composted, incinerated, landfilled) do not match exactly for some Member States, and all the more when they are aggregated at the EU level.

760 kg per person in Cyprus to less than 320 kg per person in the Czech Republic, Poland, Estonia and Latvia.

2.1.3 Recycling rate (of municipal waste), 2010

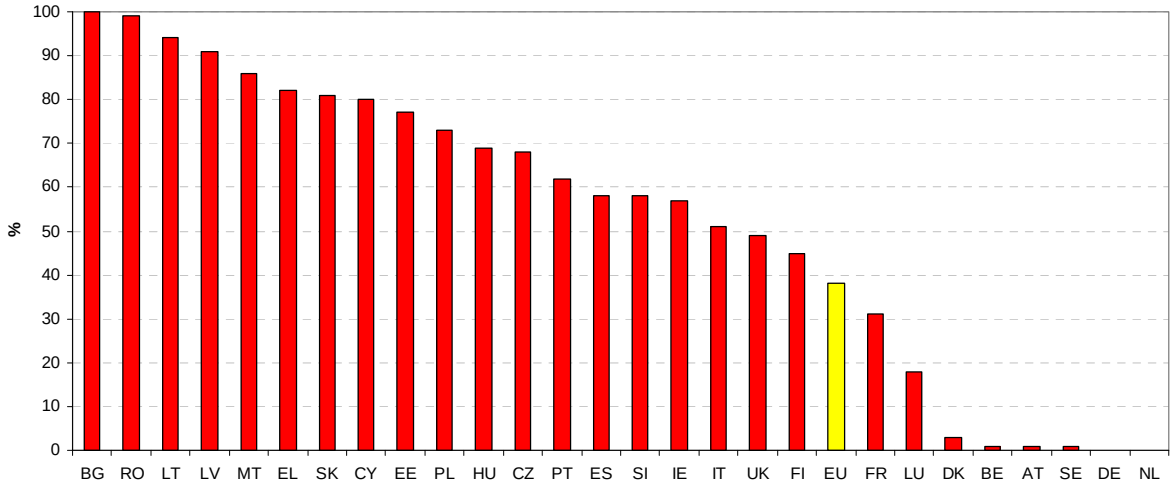


Source: Eurostat, 2012

Increasing re-use/recycling in line with the principles of the 'waste hierarchy' will contribute directly to improving resource and material efficiency.

The indicator measures the share of municipal waste recycled, reused or composted on total municipal waste treated. In the EU, on average 40% of total municipal waste is recycled/reused or composted. This share varies considerably among Member States: from more than 60% in four countries (the Netherlands, Belgium, Germany and Austria) to less than 10% in four countries (Slovakia, Lithuania, Romania and Bulgaria).

2.1.4 Landfill rate (of municipal waste), 2010



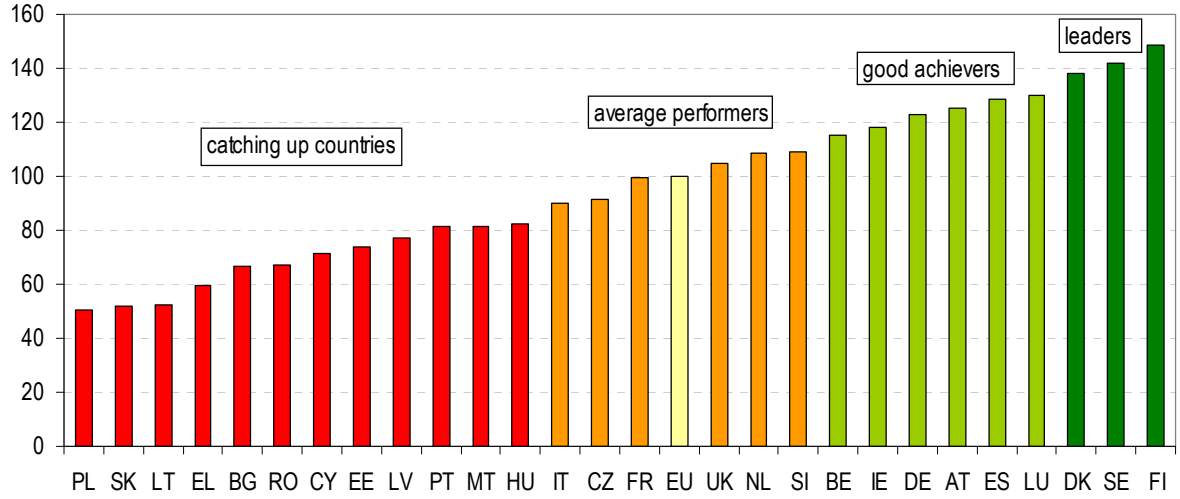
Source: Eurostat, 2012

Landfilling represents the waste treatment most dangerous for the environment and human health. The indicator measures the share of municipal waste landfilled on total municipal waste treated.

Landfill accounts for nearly 40% of municipal waste treated in EU in 2010. There are huge differences among Member States, which reflect the different waste management schemes in the EU: Bulgaria and – to a large extent - Romania landfill all their municipal waste; on the other hand, there are five countries (the Netherlands, Germany, Sweden, Austria and Belgium) with a landfill rate of zero or close to it.

2.2. Supporting research and innovation

2.2.1 Eco-innovation index (EU=100)
2011



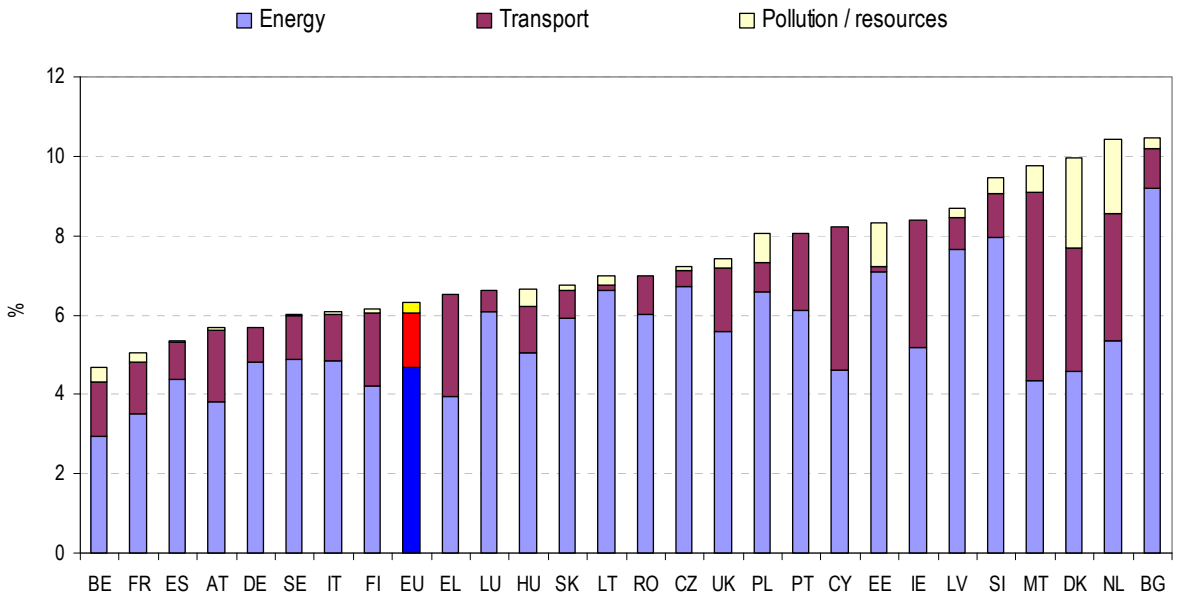
Source: European Commission, Eco-Innovation Observatory, 2012

Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle.

The Eco-Innovation Scoreboard is the first tool to comprehensively assess and compare eco-innovation performance across the EU-27 Member States. It is an index based on 16 indicators in five areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, environmental outcomes and socio-economic outcomes. The Eco-Innovation Observatory groups countries into four: eco-innovation leaders (3 countries), good eco-innovation achievers (6), average eco-innovation performers (6) and catching up (12) countries.

2.3. Getting the prices right

2.3.1 Environmental taxes
2009



Source: Eurostat, 2011

Environmental taxes are an efficient market-based instrument to achieve environmental policy objectives. The indicator measures the amount of environmental taxes (related to energy, transport, and pollution and resources) as a percentage of total taxes and social contributions - 6.3% in the EU in 2009. It shows that Member States have different taxation splits between environment and other factors such as labour and capital.

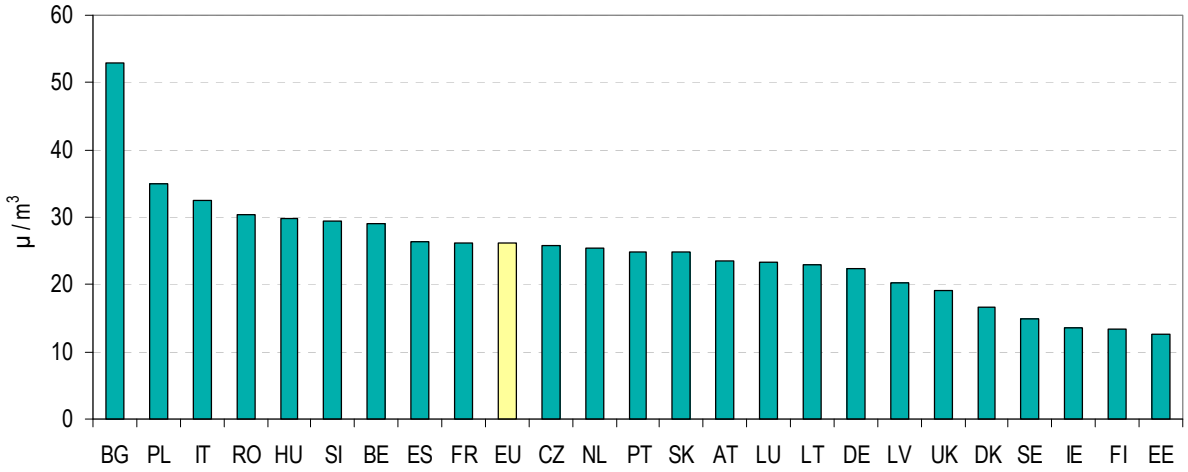
Some Member States have achieved, through various steps of environmental tax reforms, a share of environmental tax revenues in total taxes of more than 10%, while at the same time preserving fiscal revenues and improving competitiveness and energy efficiency.

Bulgaria's high share of taxes on energy is due more to the country's high energy intensity than to the tax rate (a low implicit tax rate of energy which is less than half of the EU average). An expected increase in energy efficiency could, ceteris paribus, reduce the share over time.

3. Natural capital and ecosystems

3.1. Safeguarding clean air

3.1.1 Concentrations of particulate matters (PM_{10}) 2009



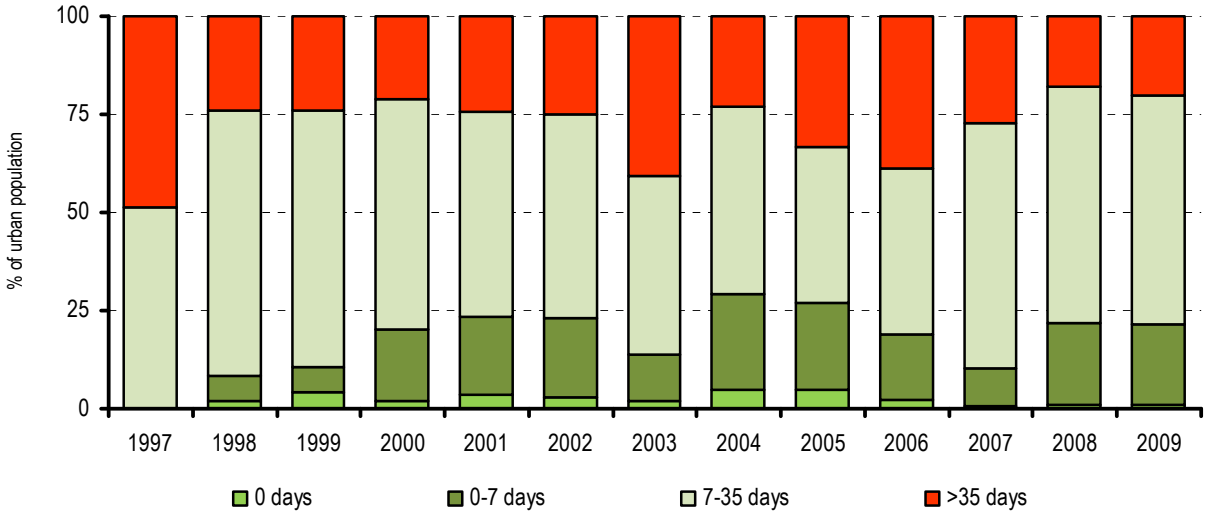
Source: EEA, 2011. Data are not available for Cyprus, Greece and Malta.

Particulate matter (PM_{10}) causes illness and reduces life expectancy: when these particles are inhaled, they penetrate into the lungs where chemicals and physical interactions can lead to irritation or damage.

The indicator measures population weighted annual mean concentration of particulate matter (PM_{10} or particulate matter with a diameter smaller than 10 µm) at urban background locations in agglomerations.

Bulgaria is the country with highest PM_{10} concentrations, with around double the EU average. Ireland, Finland and Estonia have the lowest concentrations, with around half the EU average.

3.1.2 EU population in areas with PM_{10} concentrations exceeding daily limit values, 1997-2009



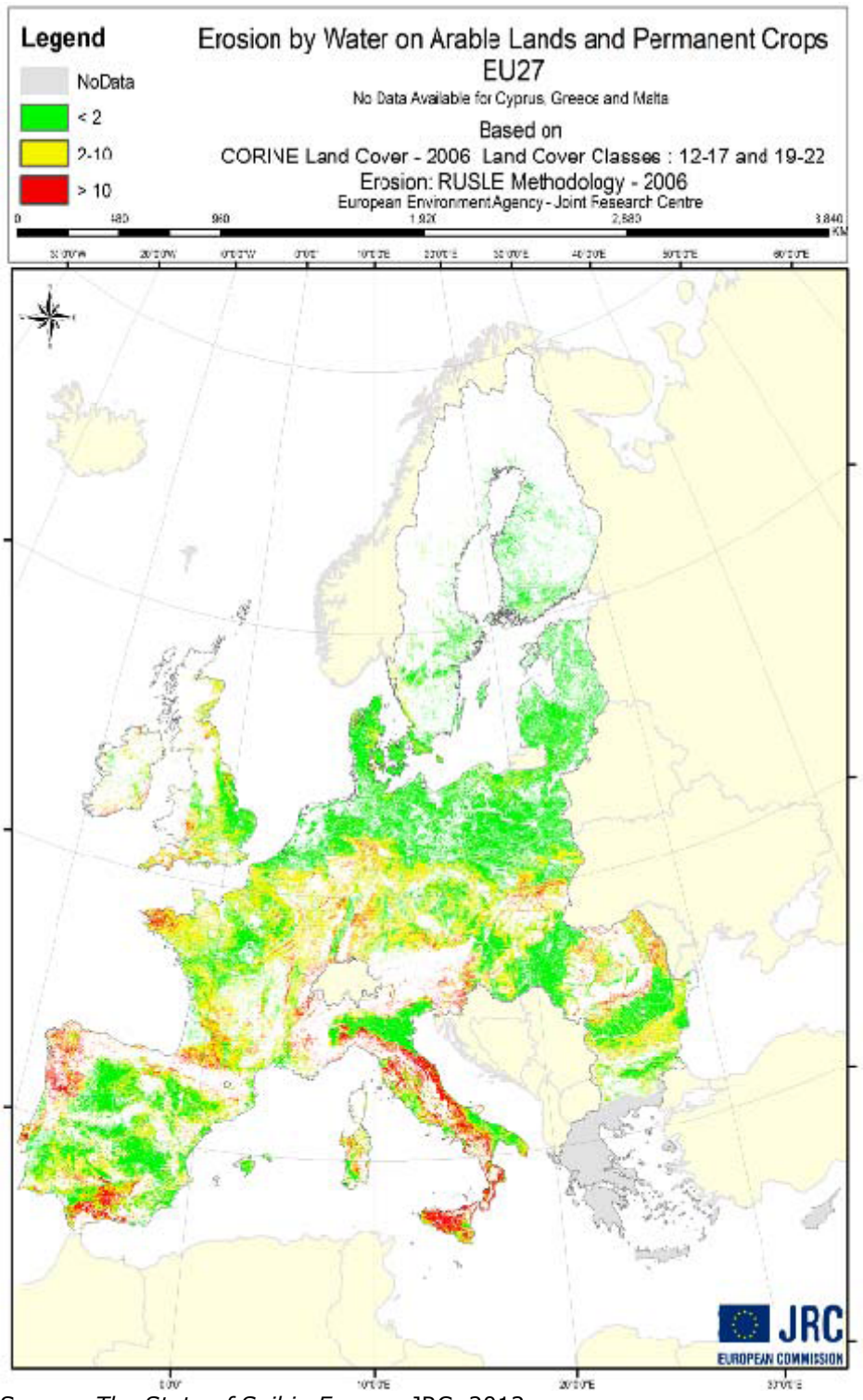
Source: EEA, 2011

Particulate matter is one of the pollutants with the largest impact on human health (cardiovascular/ lung diseases, effects on central nervous system etc.). There is no known threshold for PM_{10} under which there is no effect on human health.

The indicator measures the percentage of population in urban areas with PM_{10} concentrations exceeding daily limit values. There was some progress in the late 1990s; however there does not seem to be any significant improvement for the last ten years of measurement.

3.2. Land and soils

3.2.1 Soil erosion by water (t/ha/y), 2012



Source: *The State of Soil in Europe*, JRC, 2012

Soil erosion by water is one of the most widesread forms of soil degradation in Europe.

Erosion not only causes damages to soil functions (estimated to cost €53 million per year in the United Kingdom alone[22]); it also has an impact on the quality of freshwater as it transfers nutrients and pesticides to water bodies.

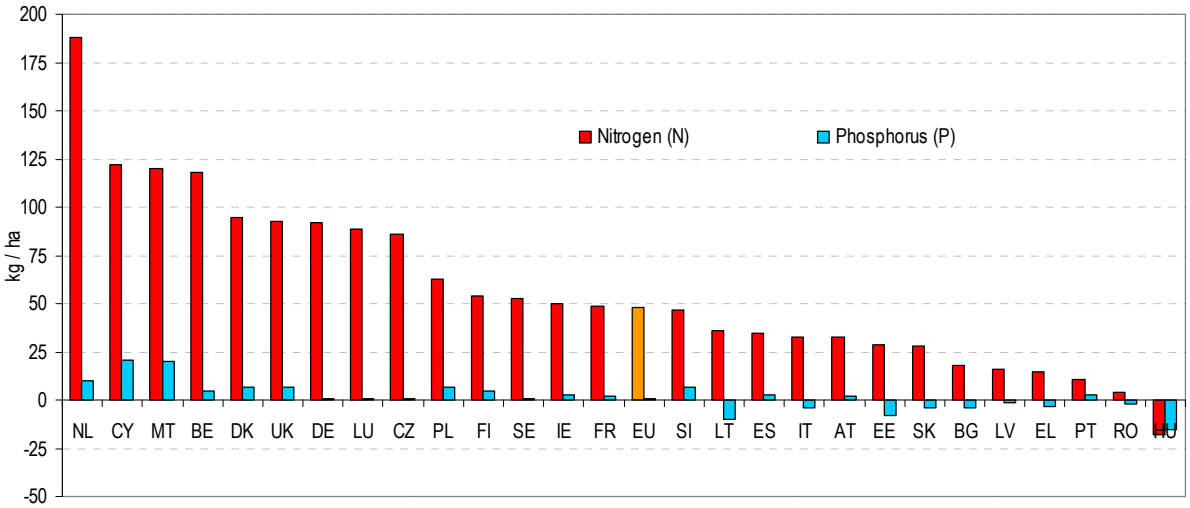
22 Safeguarding our Soils. A Strategy for England, DEFRA, 2009, p. 11.

A recent new model of soil erosion by water constructed by the JRC[23] has estimated the surface area affected in the EU-27 at 1.3 million km² (i.e. twice the surface of France). Almost 20% of this is subjected to a soil loss in excess of 10 tonnes per hectare per year - losses above 2 tonnes per ha per year are considered for most soils as being irreversible.

The mean rates of soil erosion by water in the EU-27 were estimated to be 2.76 t/ha/y; rates were higher in the EU-15 (3.1 t/ha/y) than in the EU-12 (1.7 t/ha/y), probably as the EU-15 includes the Mediterranean area where overall erosion rates are higher.

3.2.2 Gross nutrient balances

Gross nitrogen balance (nitrogen and phosphorus)
2008



Source: Eurostat.
Nitrogen values are estimates for EU, BE, BG, DK, EL, ES, FR, IT, CY, LV, LT, LU, MT and RO. Phosphorus values are estimates for EU, BE, BG, EL, ES, FR, IT, CY, LV, LT, LU, MT, RO and SI.

Nutrients, such as nitrogen (N) and phosphorus (P), are absorbed from the soil by plants for their growth. The wide use of mineral and organic fertilisers in agriculture is a significant additional source of nutrient input, and results in a persistent surplus of nutrients. This leads to potential environmental problems, such as nutrient leaching (resulting in pollution of drinking water and eutrophication of surface waters), ammonia emissions (contributing to acidification, eutrophication and atmospheric particulate pollution), or emissions of nitrous oxide (a greenhouse gas). Moreover, the production of nitrogenous fertilisers has a significant environmental impact as it requires a great deal of energy and raw materials.

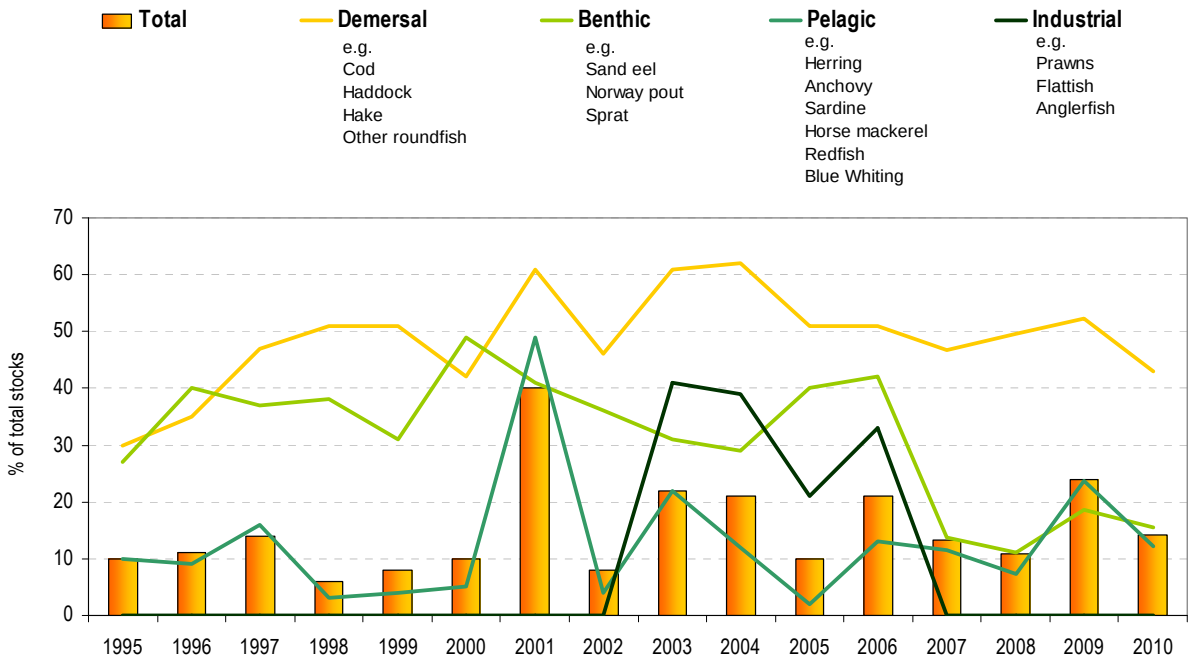
The gross nutrient balance measures the balance of nitrogen and phosphorus per hectare of agricultural land. In 2008, the gross nitrogen balance for the EU-27 averaged 48 kg of nitrogen per hectare of agricultural land, ranging from 188 kg per hectare in the Netherlands to -18 kg per hectare in Hungary, indicating a risk for soil fertility. The nitrogen balance was generally lower among those Member States that joined the EU in 2004 or 2007.

The gross phosphorus balance for the EU-27 was on average 1 kg of phosphorus per hectare of agricultural land; in part this lower surplus reflected the lower use made of phosphorus-based fertilisers when compared with nitrogen-based fertilisers. The phosphorus balance ranged from at least 20 kg per hectare in Cyprus and Malta to -15 kg per hectare in Hungary.

[23] RUSLE – revised Universal Soil Loss Equation model

3.3. Marine resources

3.3.1 Fish catches from stock outside the safe biological limits, 1995-2010



Source: ICES, 2012 [24]. The data covers the North East Atlantic (North Sea and Baltic Sea, Bay of Biscay and the Iberian Peninsula), and excludes the Mediterranean Sea.

The indicator measures the percentage of fish catches from populations outside safe biological limits. In 2010, 14% of total catches were outside safe biological limits indicating no improvement since 1995. Demersal and benthic stocks were generally in poor condition all along the observed period. Some important pelagic stocks, which normally sustain large catches, fell outside safe biological limits for the first time in 2001, causing the large variation in the indicator for that year. The fall in industrial stock catch in 2007 is due to a ban on fishing for sand eel.

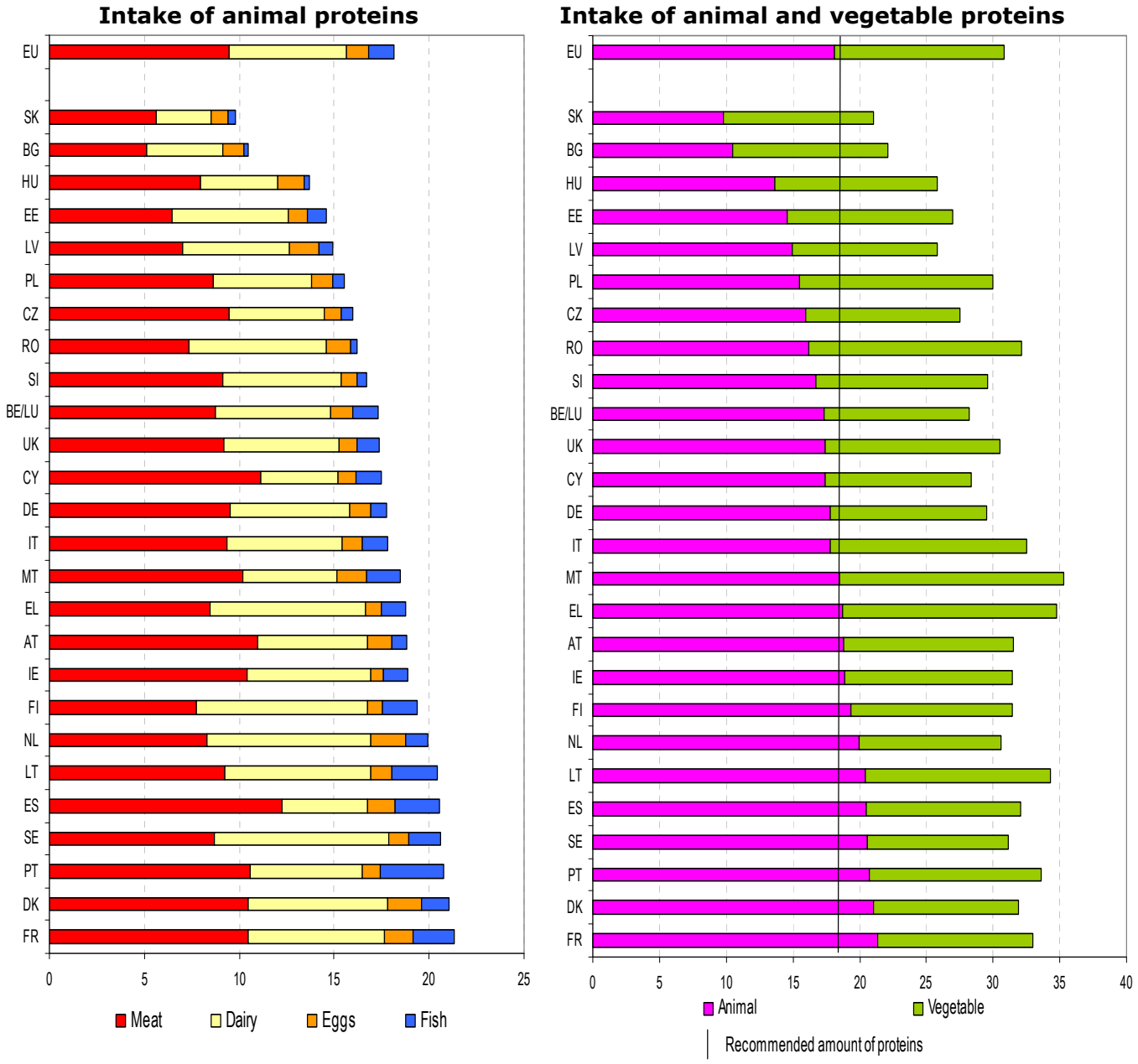
Many European fish stocks are delivering much less than they could if they were managed at sustainable levels. The worst affected fish are cod, haddock, hake and other roundfish.

[24] Demersal fish live close to the bottom of the sea and depend up on it. Benthic fish live on or in the sea bed, while pelagic fish spend most of their lives in open water. Products from industrial fish are used for industrial processes (e.g. production of fish meal and fish oil used in aquaculture), not for direct human consumption

4. Key sectors

4.1. Addressing food

4.1.1 Consumption of meat and dairy products (kg per capita per year) 2007



Source: PBL Netherlands Environmental Assessment Agency, report "*The protein puzzle. The consumption and production of meat, dairy and fish in the European Union*", 2011, based on FAO.

One of the activities or resources that contributes most to environmental pressures and impacts is agricultural goods, particularly products from animals, which are fed more than half of all world crops[25]. Agricultural production accounts for 70% of the global freshwater consumption and 38% of the total land use. Food production accounts for 19% of the world's greenhouse gas emissions and 60% of the phosphorus and nitrogen pollution and 30% of toxic pollution in Europe.

[25] *"Environmental Impacts of Consumption and Production: Priority Products and Materials",* UNEP International Panel for Sustainable Resource Management, June 2010

In addition, animal protein production is much less efficient than that of vegetable protein: to produce one kilogram of protein from cereals requires the use of 20 m^2 of land; for poultry meat and milk this is 35 m^2, for pork 60 m^2 and for beef over 100 m^2.

Consumption of animal protein is also responsible for a large part of human health problems (overconsumption can lead to obesity, diabetes, cardiovascular diseases, and cancer).

The WHO provides recommendations in terms of protein requirements[26] which correspond to just over 18 kg per capita per year; this can be recalculated into protein intake. The indicator measures the consumption of proteins from meat (bovine, pig, poultry and other) and dairy products per capita per year, in terms of protein intake.

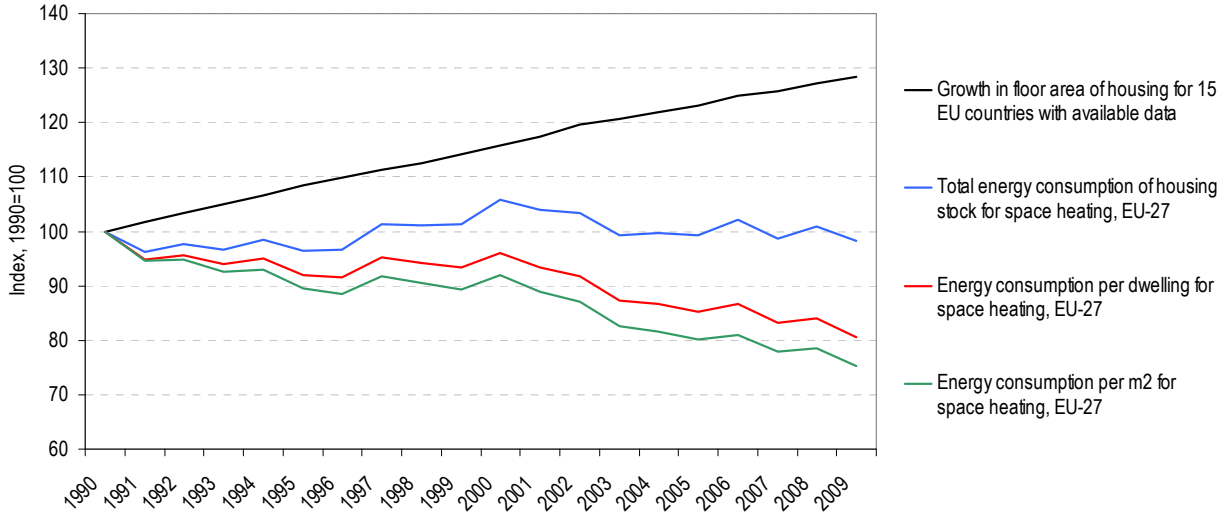
The difference in consumption of animal proteins between the Member States is more than a factor of two (graph on the left), from 9.8 kg/capita/year of Slovakia to 21.3 in France. Total protein intake (graph on the right) shows smaller differences but is higher than recommended in all Member States.

[26] The WHO advises 0.83 grams of protein per kilogram of human body weight for adults (see "Protein and Amino Acid Requirements in Human Nutrition. WHO technical report series 935 (ed FAO/UNU), 2007, WHO, Geneva; http://whqlibdoc.who.int/trs/WHO_TRS_935_eng.pdf).

4.2. Improving buildings

4.2.1 Energy consumption per m² for space heating

Energy consumption per m² for space heating, EU, 1990-2009

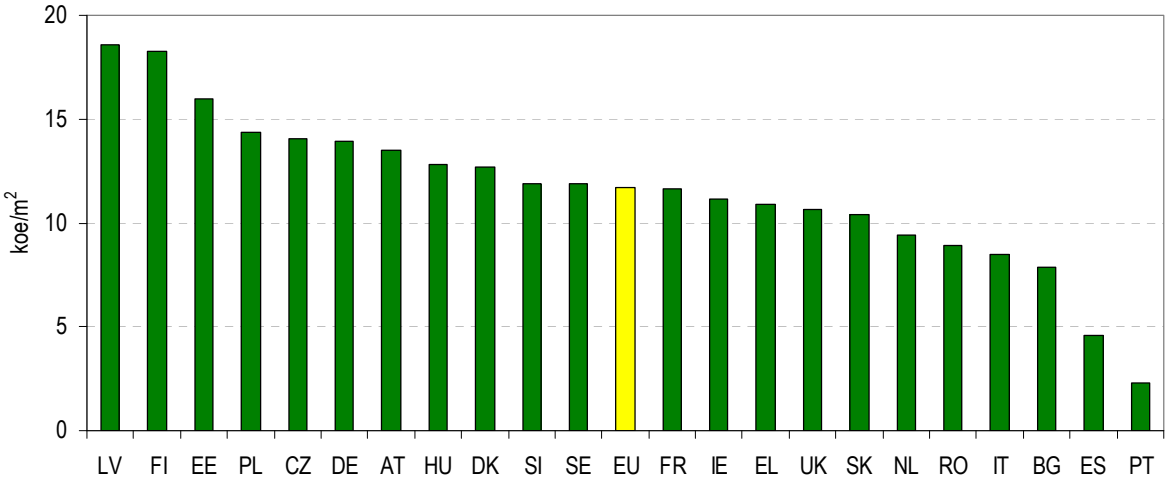


Source: EEA 2011, based on ODYSSEE MURE database.

The energy consumption of houses and buildings – taking into account the whole life cycle – is responsible for 40% of total EU energy consumption and is the main contributor to greenhouse gas (GHG) emissions.

The energy consumption of houses per m² for space heating had decreased by around 25% in 2009 compared to 1990. However the growth in floor area of housing has fully offset improvements in energy efficiency per m².

Energy consumption per m² for space heating, 2009

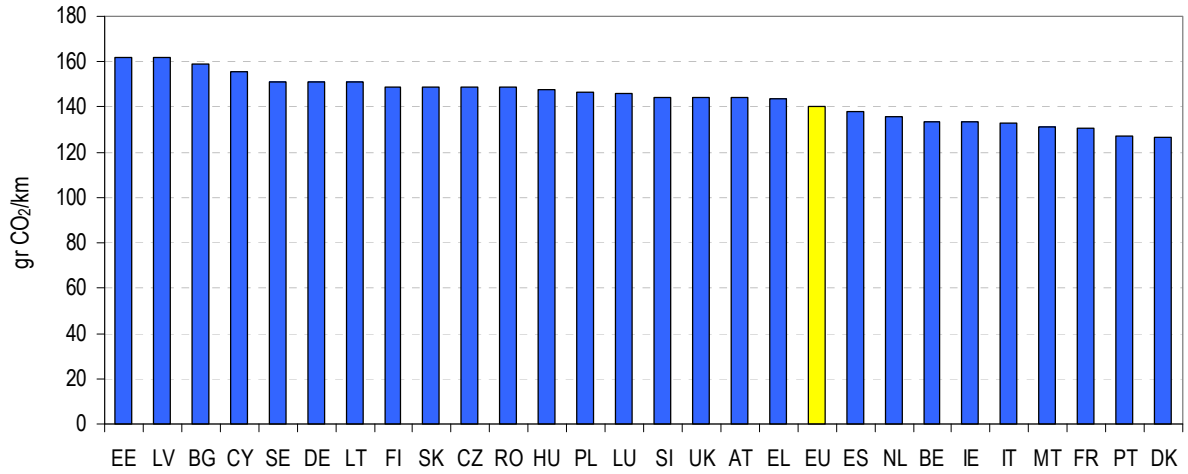


Source: ODYSSEE MURE database. Data are climate corrected. Data for Spain, Slovenia and Romania refer to 2008. No data available for Belgium, Cyprus, Lithuania, Luxembourg and Malta.

There are significant differences among countries, ranging from 2.3 kg oil eq./m² in Portugal to 18.6 kg oil eq./m² in Latvia showing potential for big improvements in buildings' energy efficiency for heating.

4.3. Ensuring efficient mobility

4.3.1 Average CO2 emissions/km for new passenger cars 2010



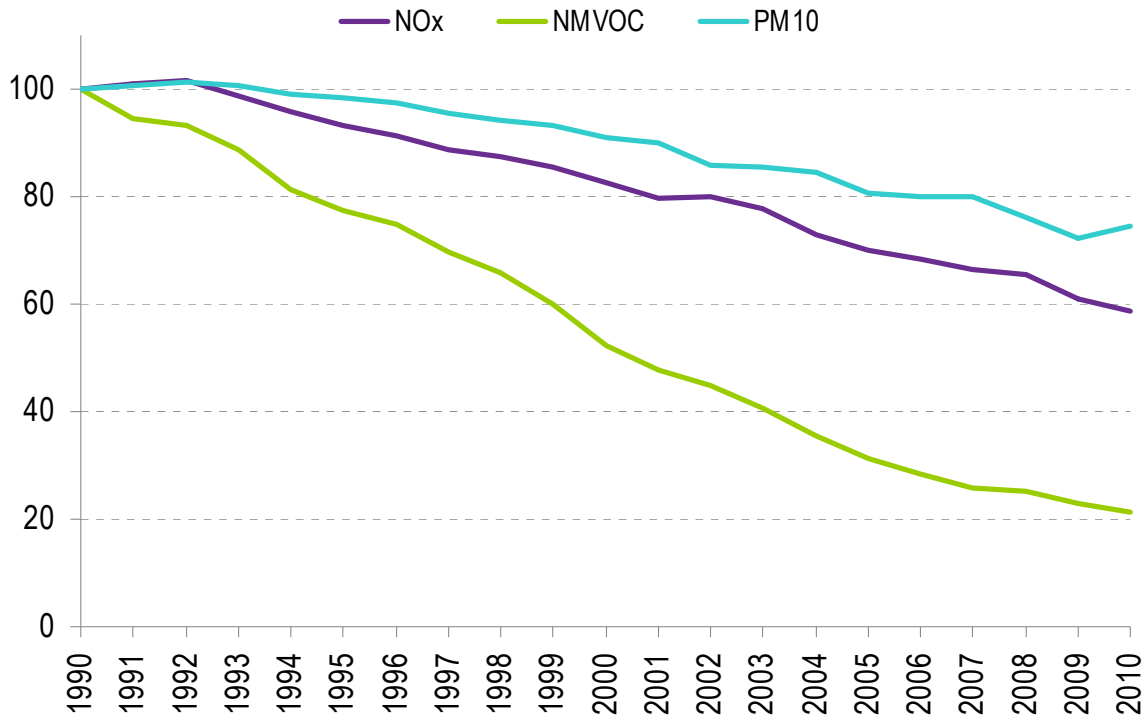
Source: EEA, 2011

Transport is one of the main contributors to GHG emissions. GHG emissions from road have increased by 23% in EU during 1990-2009.

The European Commission monitors annually average emissions of CO2 for the new car fleet to measure progress towards the fleet passenger target of 130 gCO2/km as average emissions for the new car fleet by 2015, and the target of 95 gCO2/km as average emissions for the new car fleet from 2020 onwards.

The average CO2 emissions from new cars in the EU dropped by almost 4% in 2010 compared to 2009, to 140 gCO2/km, and so is getting closer to the 2015 target.

4.3.2 Pollutant emissions (NOx, VOC and PM) from transport (index 1990=100) 1990-2010



Source: EEA, 2011. 2010 data are provisional.

Emissions from transport are the main contributor to air pollution. The indicator measures emissions of main air pollutants (NOx, VOC, PM_{10}).

Reductions achieved in the road transport sector are responsible for the vast majority of the overall reductions for each pollutant. In contrast, international aviation and shipping are the only transport sub-sectors where emissions of each pollutant have actually increased since 1990.

Annex : Definitions of the indicators

Indicator	Definition numerator	Definition denominator	Interpretation	Source
1.1 Resource productivity (GDP/DMC, EUR/kg).	Gross Domestic Product (GDP)	Domestic Material Consumption (DMC) measures the total amount of materials directly used by an economy (raw materials extracted from the domestic territory + physical imports - physical exports)	It provides indication whether decoupling between the domestic use of natural resources and economic growth is taking place.	Eurostat
1.2 Artificial land or built-up area	Artificial surface and other types of cover (million hectares)	Total surface (million hectares)	It shows the share and development of artificial surfaces.	Eurostat
1.3 Water exploitation index (WEI, %)	Annual total abstraction of fresh water	Long-term average freshwater resources.	The index shows available water resources in a country or region compared to the amount of water used. An index of over 20 % usually indicates water scarcity.	EEA
1.4 Greenhouse Gases emissions (tons per capita)	Greenhouse gases emissions (tonnes CO2 eq.)	Total population	It shows progress towards a domestic low carbon economy.	EEA
2.1.1 Total waste generation (per capita)	Total waste generated (tonnes)	Total population	It measures progress towards the waste prevention, first level of the 'waste hierarchy'. It includes waste from all sectors of economic activity.	Eurostat
2.1.2 Municipal waste	Municipal waste (tonnes)	Total population	It measures progress towards the waste prevention, looking at municipal waste, which is mainly produced by households.	Eurostat
2.1.3 Recycling rate (of municipal waste)	Municipal waste recycled, reused and composted (tonnes)	Municipal waste treated (tonnes)	It shows how much municipal waste is recycled, and used as a resource in the economic cycle.	Eurostat
2.1.4 Landfill rate (of municipal waste)	Municipal waste landfilled (tonnes)	Municipal waste treated (tonnes)	It measures how much municipal waste is landfilled and indirectly creates pressures on the environment and human health.	Eurostat

Indicator	Definition numerator	Definition denominator	Interpretation	Source
2.2.1 Eco-Innovation Index	It is based on the Eco-Innovation Scoreboard, which is the first tool to comprehensively assess and compare eco-innovation performance across the EU-27 Member States.		The Eco-Innovation Scoreboard is an index based on indicators in five areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, environmental outcomes and socio-economic outcomes.	Eco-innovation Observatory. http://www.eco-innovation.eu/
2.3.1 Environmental taxes	Environmental taxes, by type (energy/transport/ pollution and resources)	Total taxes and social contributions.	It indicates the importance of environmental taxes on the total amount of taxes and social contributions.	Eurostat and DG TAXUD
3.1.1 Concentrations of particulate matters	PM_{10} concentrations (µ)	m^3	It measures the deterioration or improvement of air quality in urban areas.	EEA
3.1.2 EU population in areas with PM concentrations exceeding daily limit values	Population living in areas with PM concentrations exceeding daily limit values	Total urban population.	It shows how much EU urban population is exposed to air with PM concentrations exceeding limit values, thus potentially dangerous for human health.	EEA
3.2.1 Soil erosion by water	Estimation of soil erosion on cultivated land through rainsplash, sheetwash and rill erosion as calculated using the RUSLE (1 km grid cells) and CORINE 2006 Land Cover database.		The indicator measures the importance of soil erosion by water, which affects soil functions and the quality of freshwater. The resulting 1km x 1km annual soil erosion risk map reports estimated soil losses in tons/hectares/year.	JRC
3.2.2 Gross nutrient balance (nitrogen and phosphorus)	Total balance: Total nutrient (nitrogen and phosphorus) input to the soil minus the total nutrient output to the soil.	Agricultural land (arable land, permanent grassland and land under permanent crops)	It measures whether the amount of fertilisers applied exceeds the plants' nutritional requirements, with a risk associated of nutrient losses from agricultural soil into ground and surface water.	Eurostat
3.3.1 Fish catches from stocks outside the safe biological limits (as percentage of total)	Fish catches from stocks outside the safe biological limits.	Total fish stock outside the safe biological limits	It indicates whether the fisheries are operating in a sustainable way, or if fish stocks are overexploited, with a risk associated of depletion.	ICES (International Council for the Exploration of the Sea)

Indicator	Definition numerator	Definition denominator	Interpretation	Source
4.1.1 Consumption of meat and dairy products per capita per year	Consumption of meat/dairy products per year (as proteins intake)	Total population	Consumption of animal protein is responsible for a large part of environmental impacts, e.g. in terms of water consumption, land use and GHG emissions.	PBL Netherlands Environmental Assessment Agency
4.2.1 Energy consumption per m^2 for space heating	Energy consumption for space heating	Total floor area of dwellings (thousand $m^{2)}$	The indicator measures the energy consumption of houses and buildings, which is responsible for 40% of total EU energy consumption (taking into account the whole life cycle)..	EEA based on ODYSSEE MURE database
4.3.1 Average CO_2 emissions / km for new passenger cars	CO_2 emissions for new passenger cars	Km	Road is the main transport mode contributing to CO_2 emissions.	EEA
4.3.2 Pollutant emissions from transport (NOx, VOC and PM)	Pollutant emissions from transport in a year (NOx, VOC and PM). Index: 1990=100	Pollutant emissions from transport (NOx, VOC and PM) in 1990	It measures the evolution of air emissions ((NOx, VOC and PM) from transport, which is the main contributor to air pollution.	EEA

Annex 3: Principles Guiding the Material Flow Accounting (MFA) Methodology

Domestic Material Consumption is an indicator derived from Material Flow Accounting (MFA). Economy-wide Material Flow Accounting provides information about the physical flows of materials through economies through an aggregate overview of the annual extraction of raw materials as well as of the physical amounts of imports and exports. This allows them to be used to measure progress with resource productivity and materials use, through information on the physical resource base of an economy or an activity.

Key strengths:

- allows for international comparison, as MFA indicators are compiled by Eurostat and the OECD;
- the methodology is well established and transparent and further development is coordinated by Eurostat;
- compatible with the system of national accounts.

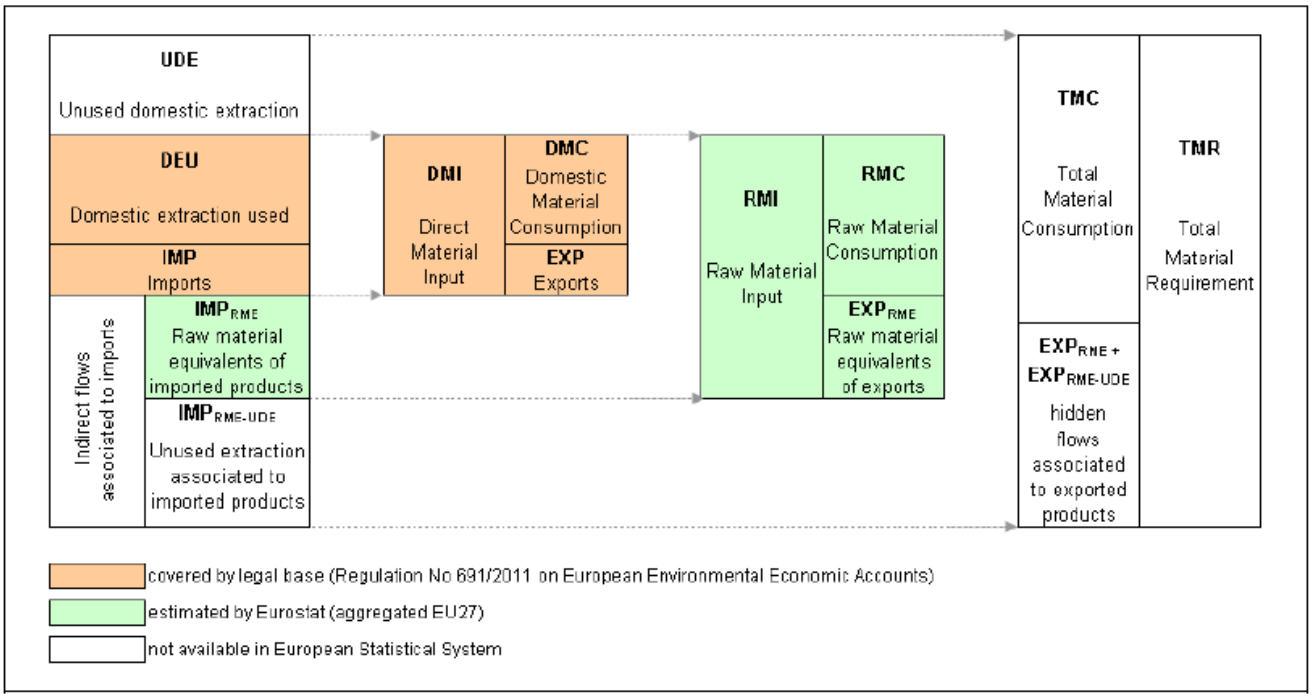
Key weaknesses of MFA-derived indicators:

- The current time delay (3 to 4 years);
- Weight in tonnes as the lowest common denominator, which does not reflect environmental impacts or economic value well;
- Using relatively crude categories of resources (biomass, fossil fuels, minerals, metals) although it would be possible to provide a detailed breakdown by some 55 material categories);
- Ignoring several resource uses such as water consumption and land use. MFA indicators account for the weight of used materials with an economic value (in other words, 'materials'). This is narrower than the definition of 'resources' used in the roadmap which goes far beyond just 'materials'.

The different components are set out in Figure 1, and then discussed in the sections below.

Source: ESTAT, Economy-wide Material Flow Accounts, for the Working Group

Figure 1: Scheme for EW-MFA and derived Indicators



1. Domestic Material Consumption

Domestic material consumption, abbreviated as DMC, measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports. The DMC indicator provides an assessment of the absolute level of the use of resources, and allows to distinguish consumption[27] driven by domestic demand from consumption driven by the export market[28].

Domestic Material Consumption (DMC) was chosen as the lead resource productivity indicator for the Roadmap because DMC is relatively widely available (in terms of coverage and time lag), and relatively robust. It offers the opportunity to relate an important part of the resource input into the economic production process to the output of economic activity.

However, it is recognised that over time a better candidate than DMC could be found In addition the time lag needs to be reduced to better address imports and exports.

2. Raw Material Input (RMI) and Consumption (RMC)

The way in which exports and imports are measured matters for calculating the levels of material consumption of economies. DMC for example has a national production perspective, which means that it would not register or 'indicate' if improvements of domestic resource efficiency are made by delocalisation of resource intensive or less resource efficient steps in the production chain to countries outside the EU. Indicators that have a life cycle or value chain perspective are needed to trace such potential effects.

Whereas DMC considers only the direct material embodied in exports and imports, Raw Material Input (RMI) and Raw Material Consumption (RMC) (excluding the raw materials equivalents of exports) add the flows required upstream along the production chain – that is, it accounts for imports and exports from the Raw Material Equivalent (RME) perspective. Thus, RMC can serve as an alternative analytical measure for material consumption, and it may be more precise than DMC for analyzing countries' material needs for maintaining a specific standard of living[29]. RMC is limited to the actual materials used and does not include hidden or indirect material requirement. The RMC indicator is being further developed by the Commission Services.

3. Total Material Requirement (TMR) and Consumption (TMC)

Imports and exports expressed by weight as crossing the borders – leaving aside potentially large material side effects in the exporting – and potentially re-importing – country ("embedded" / "embodied" / "indirect" material use). For example, an imported car is

[27] It is important to note that the term "consumption" as used in DMC denotes apparent consumption and not final consumption.

[28] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Domestic_material_consumption_(DMC)

[29] Muñoz, P., S. Giljum and J. Roca (2009) 'The Raw Material Equivalents of International Trade: Empirical evidence for Latin America' – Journal of Industrial Ecology, 13:6 p. 881-897 (p. 890)

accounted for by its weight, leaving all the materials used to make this car but not included in it unaccounted for.

Total Material Requirement (TMR) and Total Material Consumption (TMC)[30] include RMI or RMC plus the hidden material flows such as water, energy, and waste in production. Currently, there is more country data on TMR than TMC[31], though for both there is less data than on DMC.

While not part of a regularly reported Eurostat MFA data set, calculation of 'global' resources use associated with domestic production is possible as some data is available (Wuppertal Institute and SERI) and estimation techniques exist.

[30] TMC measures the total primary material requirement associated with domestic consumption activities. TMC equals Total Material Requirement minus exports and their hidden flows (in economy-wide material flow accounting) > OECD statistical terms glossary: http://stats.oecd.org/glossary/detail.asp?ID=6595

[31] Bassi, S., Mazza, L., ten Brink, P., Medarova, K., Gantioler, S., Polakova, J., Lutchman, I., Fedrigo-Fazio, D., Hjerp, P., Baroni, L. and Portale, E. (2011) Opportunities for a better use of indicators in policy-making: emerging needs and policy recommendations. Deliverable D7.2 of the IN-STREAM project.

Annex 4: Comparison between Annex 6 of the Roadmap and the indicators presented in the Scoreboard

The indicators included in the draft Scoreboard closely match with those that were presented in Annex 6 of the Roadmap. Nevertheless there are some differences. These are discussed in detail in this annex.

Some of the indicators included in Annex 6 of the Roadmap could not be included in the draft Scoreboard because no sufficient data are available. In addition two new indicators were introduced (Eco-Innovation Index and Gross nutrient balance), because they fullfill the criteria set out in the paper.

Finally, in order to allow for country comparisons, some indicators have been expressed in relative terms (per capita) or expressed differently to address some quality concerns (e.g. recycling and landfill as a share of municipal waste).

The table below provides an overview of the differences (in italic) between Annex 6 of the Roadmap and the indicators presented in the draft Scoreboard (*differences in Italics).*

	Draft Resource Efficiency Scoreboard	**Annex 6 of the Roadmap**
1	*Municipal waste generation*	Not included
2	*Eco-Innovation Index*	Not included
3	*Gross nutrient balance (nitrogen and phosphorus)*	Not included
4	GHG emissions *(per capita)*	GHG emissions
5	Recycling rate *of municipal waste*	Overall recycling rate
6	Landfill rate *of municipal waste*	Landfill rate
7	Fish *catches* from stocks outside the safe biological limits	Share of fish and shellfish populations within safe biological limits

1. **Municipal waste generation.**
   This indicator was included given that it is one of the former structural indicators related to the Lisbon strategy. The indicator allows for better MS comparisons, because it excludes specific categories of waste (e.g. mineral and construction waste) which can be considerably higher for some countries. In addition, time coverage and timeliness are better than for total waste generation (time series 1995-2010 instead of 2004- 2006-2008).

2. **Eco-innovation Index.**
This indicator is an index developed for the Eco-innovation Scoreboard[32] and promotes a more systemic view on economic, environmental and social performance. It is based on a set of 16 indicators related to 5 themes: Eco-Innovation inputs, Eco-innovation activities, Eco-innovation outputs, Environmental outcomes and Socio-economic outcomes. It can be considered as a proxy for investment in research and innovation on resource efficiency.

3. **Gross nutrient balance (nitrogen and phosphorus).**
This indicator is one of the agri-environmental indicators It measures whether the amount of fertilisers applied exceeds the plants' nutritional requirements, which is a risk associated of nutrient losses from agricultural soil into ground and surface water. It is directly linked to the use of fertilisers, whose production has a high environmental impact in terms of material and energy.

4. **GHG emissions (per capita)**
In order to make country comparisons, the GHG emissions indicator has been divided by the country population.

5. **Recycling rate of municipal waste.**
This indicator is preferred to the overall recycling rate, because it allows for better country comparisons as it is not affected by other waste categories which can disturb the statistic in some countries due to the large proportions it can take (e.g. mineral and demolition waste). In addition, time coverage and timeliness is better than the total recycling rate (time series 1995-2010 instead of 2004- 2006- 2008).

6. **Landfill rate of municipal waste.**
This indicator is preferred to the overall landfill rate, because it allows for better country comparisons as it is not affected by other waste categories which can disturb the statistic in some countries due to the large proportions it can take (e.g. mineral and demolition waste). In addition time coverage and timeliness is better than the total recycling rate (time series 1995-2010 instead of 2004- 2006- 2008).

7. **Fish *catches* from stocks outside the safe biological limits**
This indicator is the best available indicator to measure sustainable catches. The indicator 'share of fish and shellfish populations within safe biological limits', which was proposed in Annex 6 of the Roadmap is currently being developed and is expected to be available by the end of 2012.

[32] The Eco-Innovation Scoreboard is developed by the Eco-Innovation Observatory (EIO), a 3-year initiative financed by the European Commission's Directorate-General for the Environment. It is the first tool to assess and illustrate eco-innovation performance across the 27 EU Member States. See http://www.eco-innovation.eu/index.php?option=com_content&view=article&id=2&Itemid=34