Folder | Annual Indicator Report Series (AIRS)

Resource efficiency and low carbon economy

European Environment Agency

Cover design: EEA
Cover photo: © EEA
Layout: EEA

Electronic publication notice
This report has been generated automagically by the EEA Web content management system on 27 Apr 2017, 01:52 PM.
This report is available as a website at https://www.eea.europa.eu/airs/2016/resource-efficiency-and-low-carbon-economy. Go online to get more interactive facts and figures.
On the report web page you may download the electronic publication (EPUB) for easy reading on your preferred eBook reader.
Please consider the environment before printing.

European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark
Tel.: + 45 33 36 71 00
Fax: + 45 33 36 71 99
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Contents

Resource efficiency

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Resource productivity	▲	Improve economic performance while reducing pressure on natural resources — Roadmap to a resource efficient Europe	●
There was a decline in the use of materials and a rapid rate of increase in resource productivity following the economic downturn of 2007/2008. The rate of increase in resource productivity has been projected to return to the more gradual rate seen prior to the economic downturn of just below 1 % per year			

The Seventh Environment Action Programme (7th EAP) includes the objective that by 2020 resource efficiency has to improve. Increasing resource efficiency can lower environmental burdens by reducing the overall consumption of materials and other resources, while helping to sustain economic development by securing the supply of resources and investments in innovation. Resource productivity — economic output per unit of material used — provides a proxy for resource efficiency. Between 2000 and 2015, resource productivity in the EU increased by 35 %. Most of this increase occurred after 2008. The increase since 2008 has mostly resulted from reduced activity in the material-intensive industries of manufacturing and construction, which are sectors strongly affected by the economic downturn. The longer term improving trend in resource productivity is expected to continue until 2020, despite the recovery in the European construction and manufacturing sectors.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

The 7th EAP priority objective 2 (EU, 2013) includes the objective that by 2020 the resource efficiency of the EU has to improve. Resource efficiency can lower environmental burdens by reducing the overall consumption of materials and other resources. It can also help to sustain economic development by securing the appropriate supply of resources and investments in innovation, while increasing global competitiveness (OECD, 2015). This briefing presents trends in resource productivity. Since resource productivity measures the quantity of economic output produced using a certain amount of extracted resources, it is used as a proxy for resource efficiency by the European Commission. It effectively measures the decoupling of material use from economic growth. However, under conditions of relative decoupling, overall material use can increase despite an increase in resource productivity.

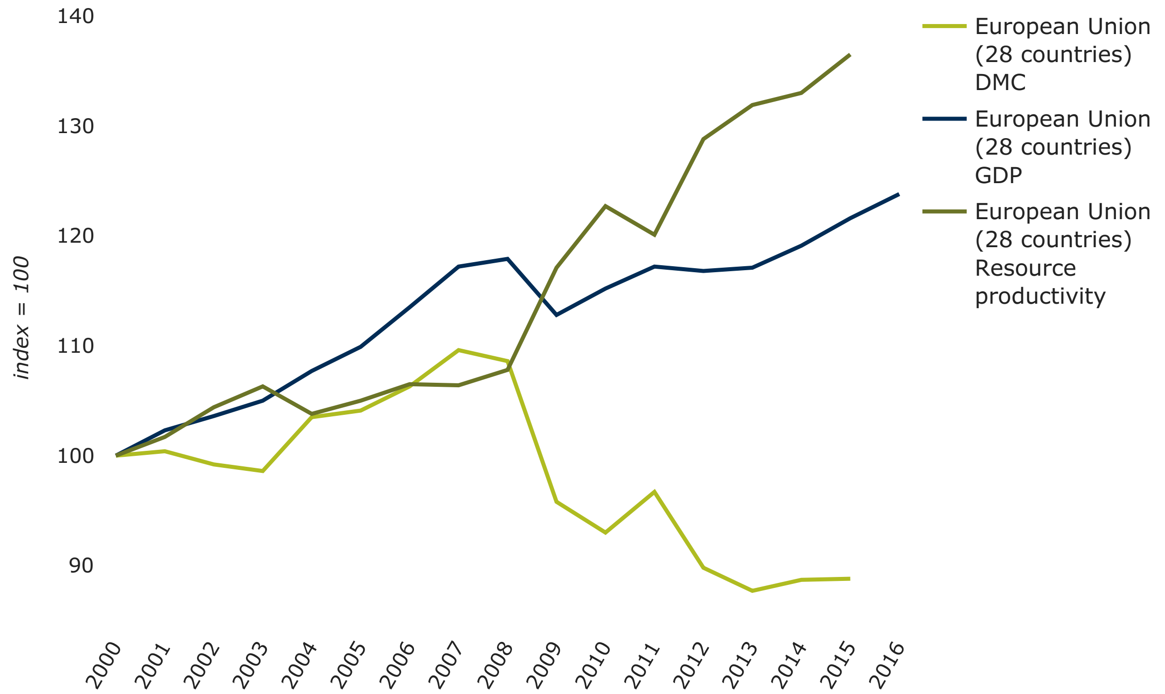
Policy targets and progress

The ‘Resource-efficient Europe’ flagship initiative (EC, 2011a) of the Europe 2020 Strategy is aimed at promoting the decoupling of economic growth from resource use. Absolute decoupling means that resource use declines or remains stable under conditions of economic growth.

The broad objectives of the ‘Resource-efficient Europe’ flagship initiative are implemented by the Roadmap to a Resource Efficient Europe (EC, 2011b) whose goal is to ensure increasing economic performance while reducing pressure on natural resources. Resource efficiency is viewed as the means to achieve this objective and resource productivity is the lead indicator for monitoring the progress of the actions in the roadmap. Neither the roadmap nor any other EU policy or strategy sets quantitative targets for improvements in resource productivity, although some Member States have adopted national targets (see country-level information section).

The Roadmap to a Resource Efficient Europe committed the European Commission to discussing and agreeing on resource efficiency indicators and targets. The 7th EAP recognised that ‘Resource efficiency indicators and targets … would provide the necessary guidance for public and private decision-makers in transforming the economy. Once agreed at Union level, such indicators and targets will become an integral part of the 7th EAP.’ While targets have not been defined to date, a set of indicators has been published since 2015 in the form of the Resource Efficiency Scoreboard (EC, 2015a).

Figure 1. Resource productivity, domestic material consumption (DMC) and gross domestic product (GDP) in the European Union



Note:
2013 is the latest year for Norway and Serbia.
Resource productivity is measured in Euros (chain-linked volumes, reference year 2010) per kilogram of domestic material consumption (euroCLV2010/kg DMC).

Data sources: a. Eurostat. Material flow accounts (env_ac_mfa)
b. Eurostat. GDP and main components (nama_10_gdp)

Although there were some fluctuations, 2000 to 2007 was a period during which material use (domestic material consumption, DMC) saw relative decoupling from economic growth (gross domestic product, GDP). In other words, material use grew but at a slower rate than the economy. Resource productivity for the EU as a whole increased by nearly 7 % over this period. The period from 2007 onwards is characterised by absolute decoupling, as material use has declined sharply.

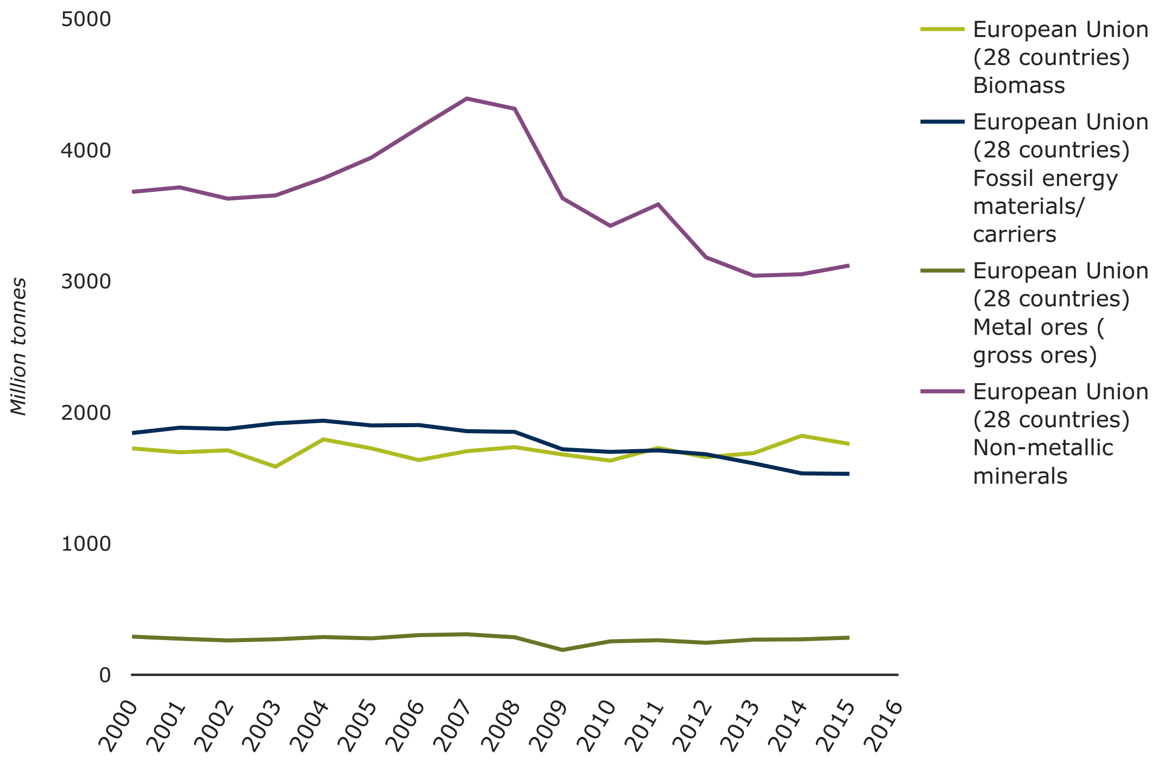
Between 2008 and 2009, both material use and GDP decreased, although material use fell more rapidly than GDP. Since 2009, despite some return to economic growth, material use has continued to fall. The overall result of the trends in these two variables is that resource productivity increased by 35 % between 2000 and 2015, with most of the improvement occurring after 2008.

Europe appears to be extracting more value from the material resources it uses. While this is indeed a positive development, a closer look reveals that it would not be justified to attribute this entirely to the success of environmental policies. Other economic and technical factors seem to have played a role, including the changing structure of countries' economies, the effect of the economic downturn, globalisation and increasing reliance on imports, and even the nature of the indicator itself (EEA, 2016).

There have been some improvements in the resource productivity of individual sectors. Since 2008, this has been dominated by the fact that the economic downturn affected the material-intensive industries of manufacturing and construction more than it affected services, which typically are less material intensive (Eurostat, 2015a).

The 19 % drop in total material use between 2007 and 2015 was largely due to a 29 % decline in the demand for non-metallic minerals (Figure 2). This was caused by a slump in the construction sector where gross value added (in chain-linked volumes, reference year 2010) fell by almost 17 % over the same period (Eurostat, 2016a).

Figure 2. Domestic Material Consumption (DMC) by type of material, EU



Data sources:	Eurostat. Material flow accounts (env_ac_mfa)

A slowdown in construction activity can have significant implications for the resource productivity of the economy as a whole. In 2007, the construction sector was responsible for more than one third of total material use in the EU (Eurostat, 2016b) but contributed only 6.4 % of its total economic output (Eurostat, 2016a). Therefore, this sector had a low resource productivity compared with the economy as a whole. Any shrinkage in this sector, as occurred between 2007 and 2013, will therefore lead to an increase in the resource productivity of the whole economy. The same is true for the manufacturing industries.

There have also been some improvements in the resource productivity of some other sectors. A notable example is the decline in the consumption of fossil fuels since 2004. This decline accelerated immediately after the economic downturn and is also the result of an increasing shift from fossil fuels to renewable energy and of overall improvements in energy efficiency in the economy as a whole (EEA, 2016). These latter developments can be expected to continue to 2020 and beyond in response to EU and national climate and energy policies.

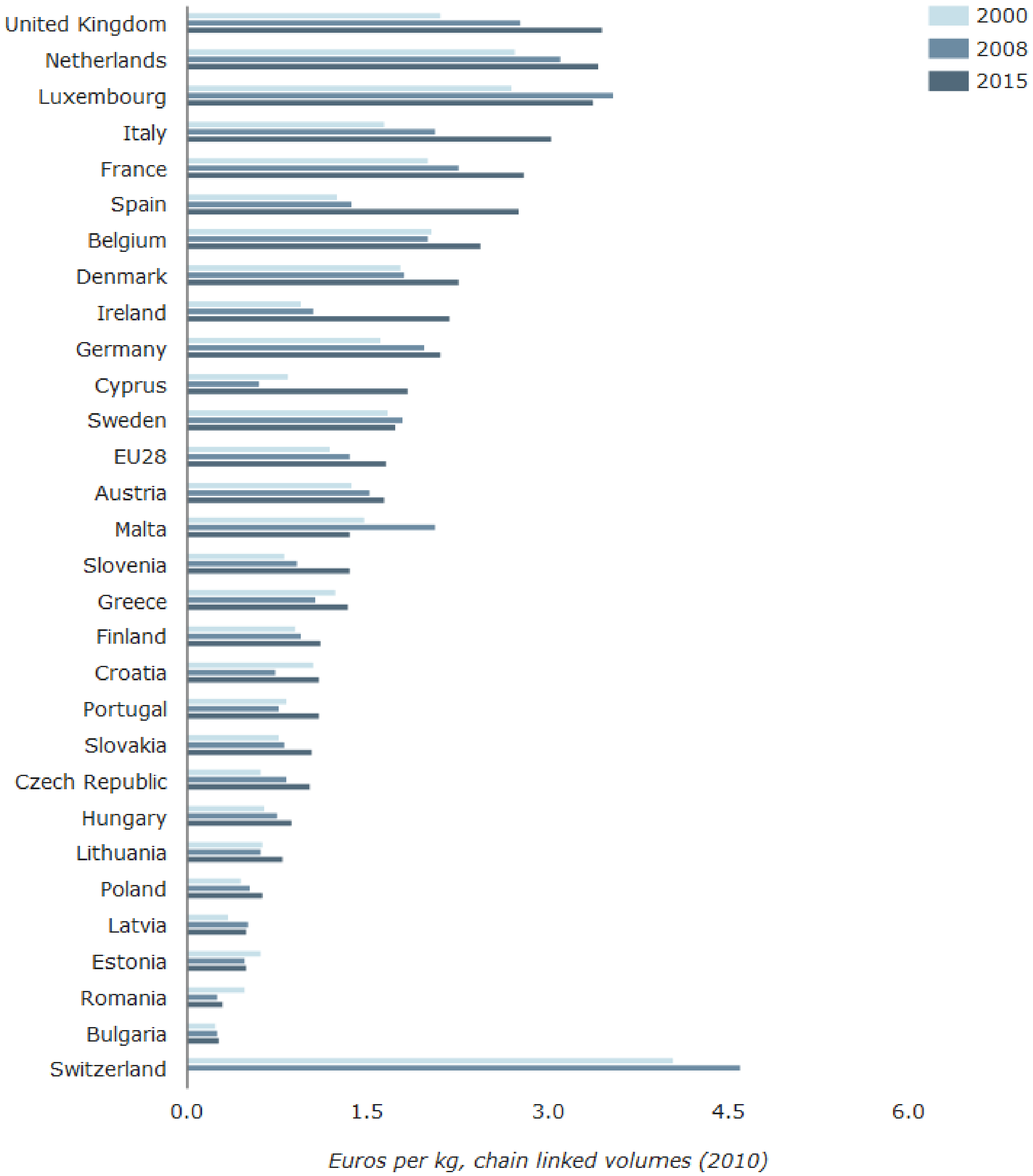
A further cause of the underlying increase in resource productivity may be the long-term shift of the EU towards a service economy. Services increased their contribution to the EU economy from 71.5 % in 2003 to 73.5 % in 2013 (Eurostat, 2015b).

Detailed projections of material use within the four main material groups from 2012 to 2030 have been carried out for the European Commission. A wide range of factors was modelled, including technological developments, policy in energy and climate, agriculture, transport and the manufacturing sector, and demographic and economic trends. The modelling analysis projects a 0.7 % rise in material use per year but a higher rate of growth in GDP, resulting in a 0.9 % increase in resource productivity per year (Cambridge Econometrics, 2014). This is similar to the rate observed between 2000 and 2008. The projections would suggest that the 7th EAP 2020 objective of increasing resource efficiency should be met.

Country-level information

Resource productivity varies between countries by a factor of nearly 20. This variation is not a sign of more efficient industry in one country compared with another, but rather a reflection of the types of material resources available in the country and its economic structures. Countries with service-based economies will tend to have higher resource productivity than economies with a high proportion of heavy industry, since service industries typically have a lower demand for material inputs (EEA, 2013).

Figure 3. Resource productivity by country



Data sources: Eurostat. Resource productivity (tsdpc100)

Note: 2013 is the latest year for Norway and Serbia. Resource productivity is measured in Euros (chain-linked volumes, reference year 2010) per kilogram of domestic material consumption (euroCLV2010/kg DMC).

Countries with the highest resource productivity in the EU are the United Kingdom, the Netherlands and Luxembourg, with values around EUR 3.5/kg. Resource productivity improved in all but three Member States between 2000 and 2015. The exceptions were Estonia, Malta and Romania. For many countries, gains in resource productivity have been most prominent since 2008. These have again largely been caused by a drop in the demand for non-metallic minerals, as a result of a post-downturn slump in the construction sector, and to longer term reductions in the consumption of fossil fuel carriers. The countries that experienced the sharpest decline in material use for non-metallic minerals between 2007 and 2015 were Croatia, Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain, ranging from a 75 % reduction in the case of Spain to a 42 % reduction in the case of Portugal.

It is hard to determine whether policy has had an effect or not. Only three countries (Austria, Finland and Germany) and two sub-national regions (Flanders and Scotland) have adopted dedicated strategies for resource efficiency. A number of other countries incorporate resource productivity concepts into other strategies and policies, including those on waste, energy and industrial development, or national reform programmes (EEA, 2016). National efforts to improve resource productivity are based on a mixture of economic and environmental considerations. The most prominent factors are the need to increase competitiveness and to secure access to raw materials and energy (or reduce reliance on imports), while lowering pressures on the environment. In addition, a number of European countries have already developed, or are planning to develop, national raw material strategies (EEA, 2016).

Moreover, nine EU Member States (Austria, Estonia, France, Germany, Hungary, Latvia, Poland, Portugal and Slovenia) have adopted resource productivity targets (as of December 2015). These vary somewhat in their scope, format and timeframes, but all aim to achieve improvements in resource productivity. It is difficult to compare the ambitions of these targets between countries because of the varying time periods over which they have to be achieved and the different starting levels in terms of resource productivity (Figure 3). With the exception of Germany, all countries' targets were adopted after the economic downturn and most since 2012. The effects of Member State targets and policies may become evident only during the second half of the decade.

Improving resource productivity has not necessarily led to reduced overall material use. Of the 25 EU Member States whose resource productivity improved between 2000 and 2015, eight (Bulgaria, Croatia, Latvia, Lithuania, Luxembourg, Poland, Slovakia and Sweden) have, nevertheless, experienced an increase in demand for materials of between 19 % and 46 % over the same period. The three countries (Estonia, Malta and Romania) that did not achieve improvements in resource productivity saw even higher increases in material use. Romania, Estonia and Malta's material use rose by 168 %, 104 % and 60 %, respectively (Eurostat, 2016b). In general, policies and targets for reducing overall material use are far less common than those aimed at increasing resource productivity.

Outlook beyond 2020

The long-term vision of the 7th EAP includes the goal that Europe's growth should be decoupled from resource use. This means not only improvements in resource productivity, but also absolute reductions in material use.

The EU has been forecast, under certain conditions, to increase its resource productivity by 14 % between 2014 and 2030 (Cambridge Econometrics, 2014). Through specific policies to promote the transition to a more circular economy, as called for by the European Resource Efficiency Platform, this rate could possibly double. While contributing significantly to the sustainability dimension of growth, increasing resource productivity by 30 % would also have a positive impact on job creation and GDP growth (EC, 2014b).

Industry already recognises the strong business case for improving resource productivity. It is estimated that resource efficiency improvements along the whole value chain could reduce the need for material inputs by 17 – 24 % by 2030 (Cambridge Econometrics, 2014). Better use of resources could represent an overall savings potential of EUR 630 billion per year for the European manufacturing industry (INNOVA, 2012).

Of the nine countries that have adopted resource productivity targets, five include targets beyond 2020: Austria, France, Latvia, Portugal and Slovenia. Austria aims to achieve a four- to ten-fold increase in resource productivity over 2008 levels by 2050. Such ambitious targets and a more resource-efficient EU will require further fundamental changes in production and consumption patterns. The adoption of the Circular Economy Package (EC, 2015a) and recent efforts by some countries to analyse their material resource availability and needs, and to develop raw material strategies, demonstrate that Member States are changing their approach towards the use of materials.

About the indicator

Resource productivity is measured here as the economic output (GDP) in euros (chain-linked volumes, reference year 2010) per unit weight (kilograms) of material use (DMC). DMC comprises the consumption of fossil energy carriers, biomass, metal ores and non-metallic minerals, such as sand and gravel, used in construction. DMC is measured as the used weight of domestically extracted material, plus the direct weight of imports, minus the direct weight of exports.

A potential weakness of using DMC in a resource productivity indicator is that DMC excludes the raw materials extracted in non-EU countries and embedded in imported goods. An alternative to DMC as a resource productivity indicator is raw material consumption (RMC). RMC presents the import and export flows expressed in their raw material equivalents. These are currently estimated with models and are still under development. RMC has been developed by Eurostat for the EU-27 but is not yet available for individual Member States. In contrast, DMC is available for all Member States, has a long time series and is disaggregated into material components.

Both DMC and RMC have their weaknesses as proxies for environmental pressures caused by material use. All material types are given equal significance when compiling DMC. This is despite large differences in scarcity and the impacts caused per kilogram by the extraction of different types of material and use, e.g. gravel versus mercury. Moreover, DMC and RMC have exhibited similar trends since at least 2002, and therefore the choice of one or the other will have had little effect on trends to date in resource productivity (EEA, 2015; Figure 2).

Footnotes and references

Cambridge Econometrics, 2014,Modelling the economic and environmental impacts of change in raw material consumption. Technical report 2014 – 2478, Luxembourg: Publications Office of the European Union.

EC, 2011a, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'A resource-efficient Europe — Flagship initiative under the Europe 2020 Strategy' (COM(2011) 21 final of 26 January 2011).

EC, 2011b, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Roadmap to a Resource Efficient Europe' (COM(2011) 571 final of 20 September 2011).

EC, 2014b, Analysis of an EU target for resource productivity, accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions 'Towards a circular economy: A zero waste programme for Europe', Commission Staff Working Document SWD(2014)211/F1 ENV (DG Environment).

EC, 2015a, 'EU Resource Efficiency Scoreboard 2015' (http://ec.europa.eu/environment/resource_efficiency/targets_indicators/scoreboard/pdf/EU%20Resource%20Efficiency%20Scoreboard%202015.pdf), last accessed 13/10/2016.

EC, 2015b, Closing the loop — An EU action plan for the circular economy (COM(2015) 614/2) (http://ec.europa.eu/priorities/jobs-growth-investment/circular-economy/docs/communication-action-plan-for-circular-economy_en.pdf).

EEA, 2013, Environmental pressures from European consumption and production, EEA Technical Report No 2/2013, European Environment Agency (http://www.eea.europa.eu/publications/environmental-pressures-from-european-consumption).

EEA, 2015,Resource efficiency,SOER 2015 briefing, European Environment Agency (http://www.eea.europa.eu/soer-2015/europe/resource-efficiency).

EEA, 2016, More from less — Material resource efficiency in Europe. 2015 overview of policies, instruments and targets in 32 countries, EEA report No 10/2016, European Environment Agency (http://www.eea.europa.eu/publications/more-from-less).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2015a, ‘Resource productivity statistics’ (http://ec.europa.eu/eurostat/statistics-explained/index.php/Resource_productivity_statistics), accessed 13/10/2016.

Eurostat, 2015b, ‘National accounts and GDP’ (http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_and_GDP), accessed 13/10/2016.

Eurostat, 2016a, ‘Gross value added and income by A*10 industry breakdowns’ (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a10&lang=en).

Eurostat, 2016b, ‘Material flow accounts’ (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_mfa&lang=en)

INNOVA, 2012, Guide to resource efficiency in manufacturing: Experiences from improving resource efficiency in manufacturing companies, Europe, accessed 27/10/2016.

OECD, 2015,Material resources, productivity and the environment, OECD Green Growth Studies, OECD Publishing, Paris.

> Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Waste generation

Indicator	Indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Waste generation in Europe	EU ▲	EEA ▲	Manage waste safely as a resource. Reduce absolute and per capita waste generation — 7th EAP	●
The historic trend shows variation in waste generation among sectors, with reduction in some, little change in others and some increases. This mixed picture suggests that the outlook to 2020 is unclear				

The Seventh Environment Action Programme (7th EAP) states that, by 2020, absolute and per capita waste generation should be in decline. A society that meets its needs while producing less waste is more resource efficient with lower environmental risks from waste management. The total amount of waste, excluding major mineral wastes, generated in Europe remained stable (only a 2 % reduction) between 2004 and 2012, with an increase between 2010 and 2012. Waste generation by the manufacturing, mining and quarrying, agriculture, forestry and fishing, and service industries has significantly reduced. Waste from households has also reduced, though more modestly. However, waste from the construction and the water and waste sectors has increased sharply. The reduction in waste from manufacturing is likely to be due to a combination of improvements in the efficiency of production processes and a shift towards less-intensive waste-generating activities as more intensive manufacturing industries move production out of Europe. In addition, the shift from manufacturing industries to service industries might also have had an effect on waste generation. However, statistical changes in the allocation of waste to the economic sectors and re-classification of waste to by-products might have contributed to the trends as well. This mixed picture suggests that the outlook to 2020 is unclear. The measures in the Circular Economy Package aim to reduce waste generation in the longer term.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

The 7th EAP includes an objective that, by 2020, absolute waste and per capita waste generation will be in decline (EU, 2013). The waste hierarchy is the central framework for EU and national waste policies. This hierarchy gives the highest priority to policies and actions that promote waste prevention, followed by preparing for reuse, recycling, other recovery and finally disposal. This briefing presents trends in waste generation. Reducing the amount of waste generated means that there is less waste to manage and also potentially that the demand for material resources and associated environmental impacts has been reduced (AIRS_PO2.1, 2016).[1]

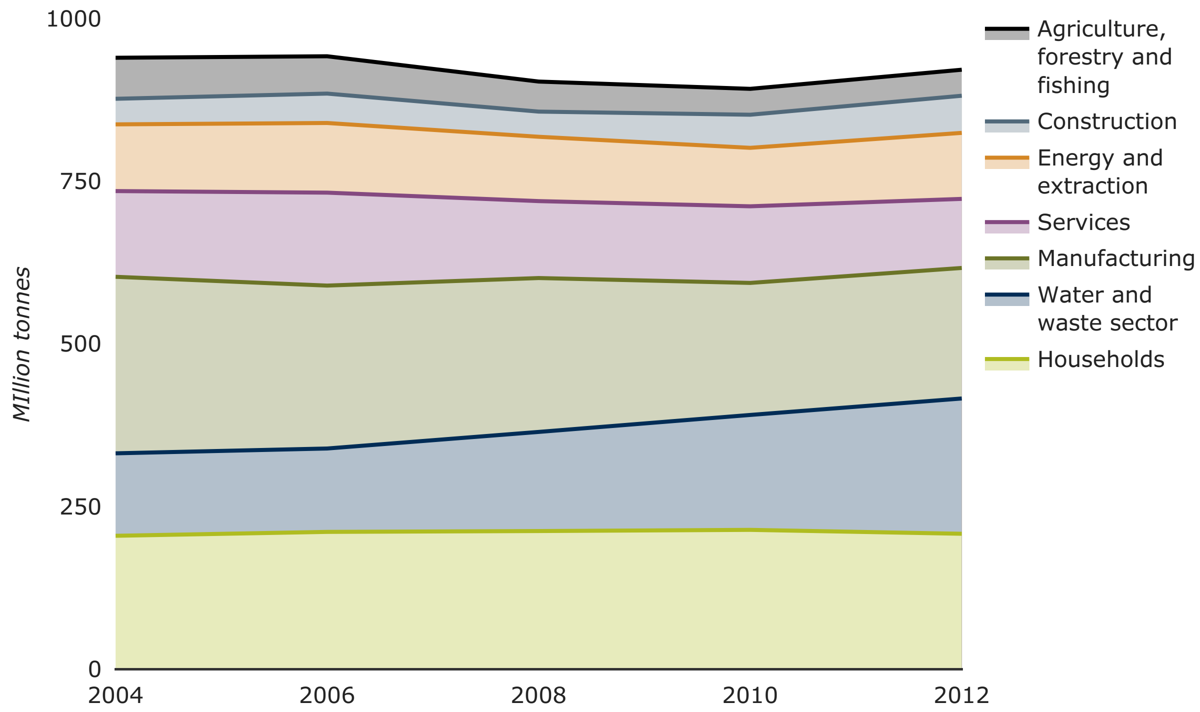
Policy targets and progress

The Roadmap to a Resource Efficient Europe includes the goal that, by 2020, waste generated per capita will be in absolute decline (EC, 2011). Waste prevention and the use of waste as a resource is becoming increasingly important, not only in environmental policy but also in industrial and raw material policy. In December 2015, the European Commission published 'Closing the loop — An EU action plan for the circular economy' (EC, 2015), otherwise known as the Circular Economy Package. Unlike the traditional linear take–make–consume–dispose approach, a circular economy seeks to respect planetary boundaries by increasing the proportion of renewable or recyclable resources while reducing the consumption of raw materials.

Approaches such as eco-design and sharing, reuse, repair and refurbishing will play a significant role in maintaining the utility of products and components, and reducing the generation of waste (EEA, 2016).

The Waste Framework Directive (EU, 2008), obliges EU Member States to adopt and implement waste prevention programmes. A review of available programmes indicates that countries use a broad range of measures with a focus on information-based instruments. However, not all programmes include quantified waste prevention targets or economic instruments (EEA, 2015).

Figure 1. Generation of waste, excluding major mineral wastes, EU



Data sources: Eurostat. Generation of waste [env_wasgen]

The total amount of waste in the EU, excluding major mineral wastes, reduced by 2 % between 2004 and 2012 (Figure 1). In 2012, the highest levels of waste generation were recorded for households, the water and waste sector and the manufacturing sector.

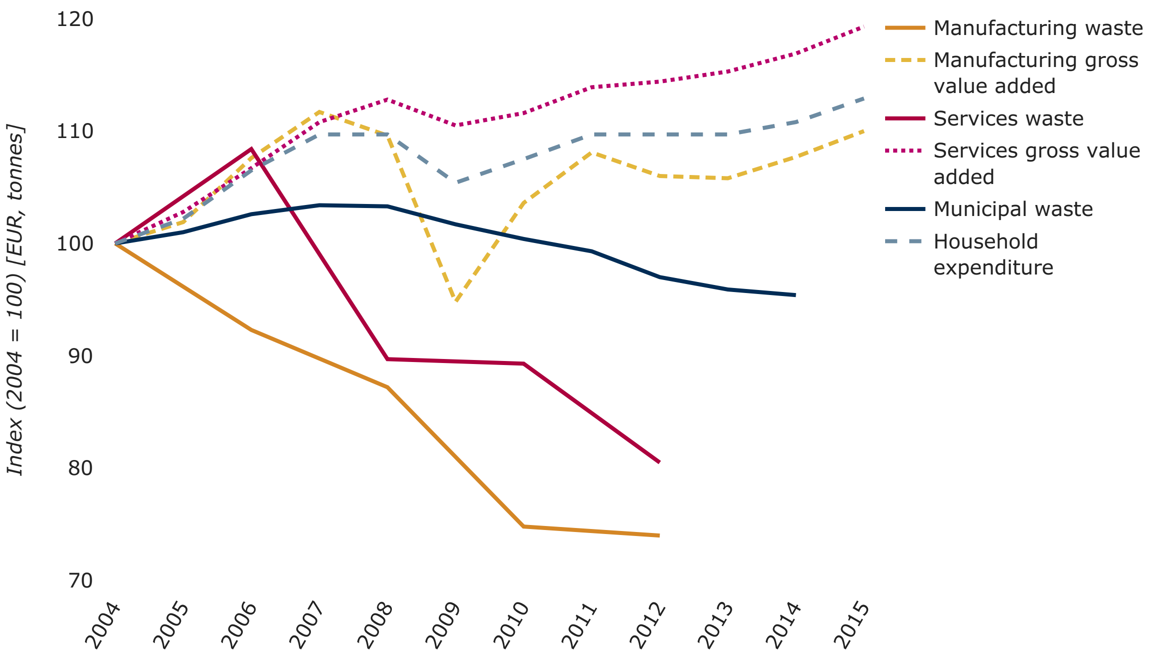
Trends in individual sectors have been mixed. Between 2004 and 2012, there was a reduction in the waste generated by agriculture, forestry and fishing (37 %), manufacturing (26 %), and services (19 %). Household waste generation declined by a more modest 5 % over the same period.

Waste generated by the water and waste sector and the construction industry grew at a rapid pace: by 61 % and 45 %, respectively, despite a dip in construction waste output in 2008 that corresponded with the economic downturn. However, waste generated by the waste sector includes secondary waste so it is likely that an increase in recycling activities has contributed to this increase, because some material that is collected for recycling cannot be recovered and has to re-join the waste stream. This effect cannot currently be quantified because of a lack of data.

Figure 2 presents indices for the waste generated by the two main production sectors of the

European economy (manufacturing and services), for the EU-28 plus Norway, and by household consumption for the EEA-33 (EU-28, Iceland, Lichtenstein, Norway, Switzerland and Turkey). Household waste comprises the bulk of municipal waste. The figure also shows a measure of the economic output of services and manufacturing (the gross value added) and a measure of consumption (household expenditure).

Figure 2. Waste generation by production and consumption activities



Data sources: a. Eurostat. GDP and main components (output, expenditure and income) b. Eurostat. Municipal waste c. Eurostat. Gross value added and income by A*10 industry breakdowns d. Eurostat. Generation of waste e. EEA. Indicator CSI 041

Some economic production and consumption activities in Europe are becoming less waste intensive, even if allowance is made for the 2008 economic downturn. Figure 2 shows that waste generation from manufacturing declined by 25 % in absolute terms between 2004 and 2012, despite an increase of 7 % in sectoral economic output. Waste generation from the service sector also declined by 23 % in the same period, despite an increase of 13 % in sectoral economic output.

Turning to consumption, total municipal waste generation in the EEA-33 declined by 2 % between 2004 and 2012, despite a 7 % increase in real household expenditure. Per capita generation of municipal waste (EEA-33), which mostly originates from households, declined by 5 % in the same period, falling from 511 to 485 kg per capita.

The overall improvements are most likely due to a combination of various factors: efficiency improvements in production processes and management, changes in the structure of the manufacturing sector, an increase in activity in the services sector and a shift towards less intensive waste-generating activities. However, some of the trends might be influenced by data quality issues. For example, the distinction between waste and by-products has a significant impact on the amounts of waste generated in agriculture, forestry and fishing; and in manufacturing (EC, 2014).

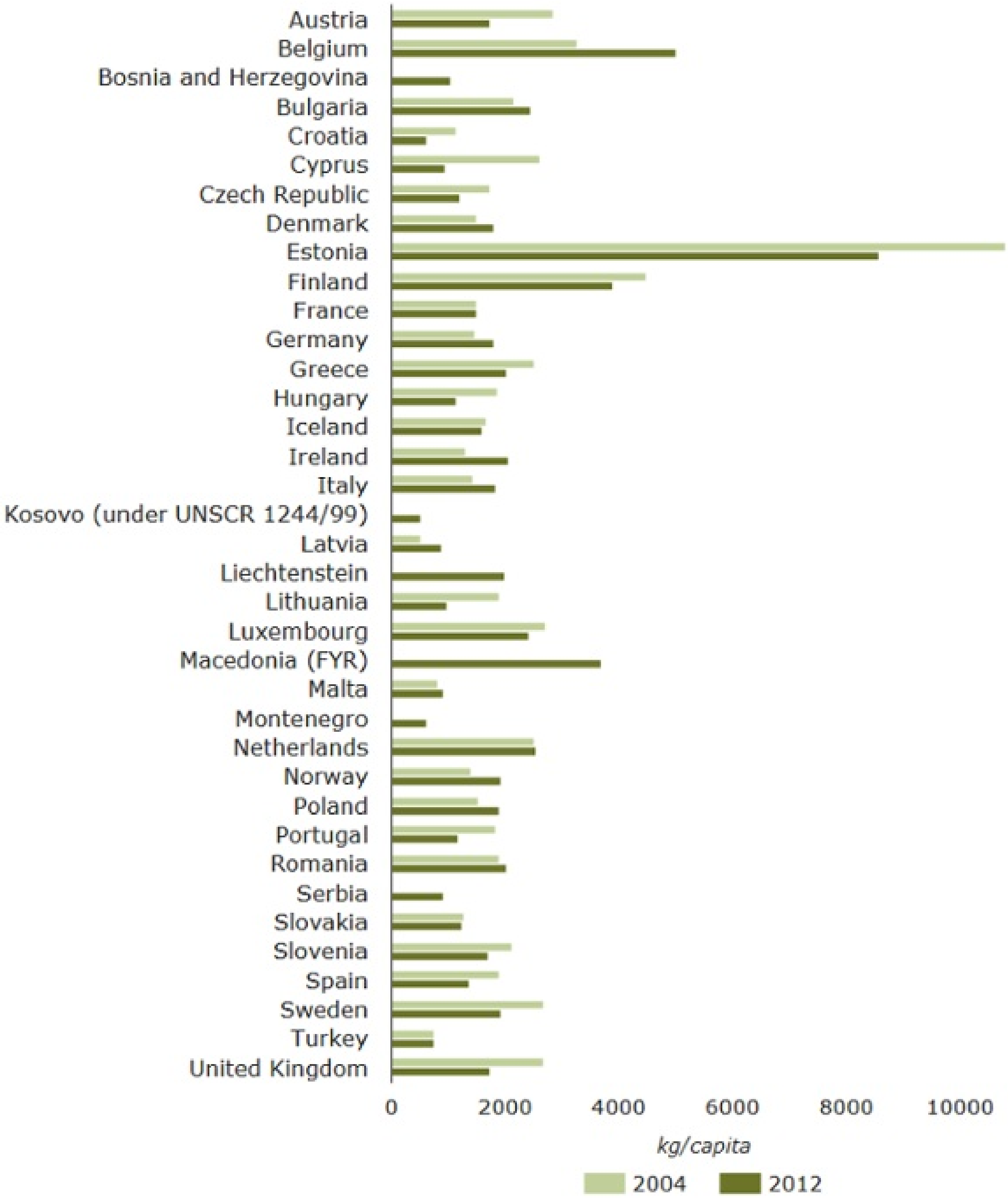
The services sector is an order of magnitude less waste intensive than the manufacturing sector: 0.014 kg/EUR in 2012 for services and 0.12 kg/EUR in 2012 for manufacturing. An economic restructuring towards more service industries can therefore be a key driver towards reduced waste generation.

The structure of production in Europe is changing. Trade liberalisation combined with lower labour costs and less regulation in many developing countries has resulted in the movement of the production of goods consumed in Europe to other regions of the world. Some sectors, including the metals, telecommunications, electrical appliances, textiles, food and chemical sectors, have been particularly affected by relocation since 2000. Some parts of the services sector have also been affected. This development may have added to the decline in waste generation (EEA, 2014).

The overall amount of waste generated has remained fairly stable, with only a slight reduction between 2004 and 2012. While some sectors are becoming less waste intensive, the prospect that total waste generation will be in decline by 2020 is uncertain. Total waste generation began to rise again between 2010 and 2012 as economies recovered. However, the Circular Economy Package and the waste prevention programmes in the EU Member States should contribute to a reduction in waste generation.

Country level information

Figure 3. Waste (excluding mineral and solidified) generation by country, 2004 and 2012 (kg/capita)



Data sources: Eurostat. Generation of waste [env_wasgen]

Figure 3 shows that the majority of European countries generate between 1 and 2 tonnes of waste (excluding mineral waste) per person per year. That figure is declining in most countries; however, increases in some countries may be due to changes in data collection methods. This is the case in Belgium (EC, 2014), and the high figures for Estonia are believed to relate to the inclusion of waste from the oil shale industry, which is included as mineral wastes in other countries (Eurostat, 2014).

Outlook beyond 2020

The long-term prospects for reducing the waste generated by production activities appear positive, although some of these gains could be associated with the movement of manufacturing industries out of Europe. A shift to a circular economy, with increased reuse of goods and materials, will reduce both consumption- and production-based waste generation. The Circular Economy Package (EC, 2015) includes a number of measures that aim to reduce waste generation beyond 2020. These include concrete measures to promote reuse and stimulate industrial symbiosis — turning one industry's by-product into another industry's raw material — and economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electric and electronic equipment, vehicles). The success of these measures will be key to the medium- to long-term prospects for reducing waste generation.

About the indicator

This indicator is defined as the weight of waste generated by an economy per year, excluding mineral wastes, dredging spoils and contaminated soils. This exclusion enhances comparability across countries, as mineral waste accounts for very high quantities in some countries and for some economic activities, such as mining and construction. If this category were included, it would account for 71 % of the total waste generated in the EU in 2012.

Waste generation data are published by Eurostat every 2 years for seven broad economic sectors: agriculture, forestry and fishing; energy and extraction; water and waste; manufacturing; construction; services; and households.

The water and waste sector includes water collection, treatment and supply, sewerage and three waste sector categories (waste collection, treatment and disposal activities; materials recovery, remediation activities and other waste management services; and wholesale of waste and scrap). The three waste sectors include secondary waste, i.e. material that has originated from other sectors.

The energy and extraction sector includes electricity, gas, steam and air conditioning supply plus non-mineral wastes from mining and quarrying. Manufacturing includes foods, textiles, wood, paper, coke, chemicals, metals, electronics, transport equipment and other machinery.

Footnotes and references

EC, 2011, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Roadmap to a Resource Efficient Europe' (COM(2011) 571 final).

EC, 2014, Report from the Commission to the European Parliament and the Council on statistics compiled pursuant to Regulation (EC) No 2150/2002 on waste statistics and their quality (COM(2014) 079 final).

EC, 2015, Closing the loop — An EU action plan for the circular economy (COM(2015) 614 final) (http://ec.europa.eu/environment/circular-economy/index_en.htm).

EEA, 2014, Environmental indicator report 2014,European Environment Agency. (http://www.eea.europa.eu/publications/environmental-indicator-report-2014).

EEA, 2015, Waste prevention in Europe — the status in 2014, EEA Report No 6/2015, European Environment Agency.

EEA, 2015, 'Waste generation (CSI 041)', European Environment Agency (http://www.eea.europa.eu/data-and-maps/indicators/waste-generation-1/assessment) accessed 5 December 2016.

EEA, 2016, Circular economy in Europe — Developing the knowledge base, EEA Report No 2/2016, European Environment Agency.

EU, 2008, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3–30).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annexe A, paragraph 43(d) (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2014, 'Waste statistics' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics), accessed 14 October 2016.

AIRS briefings

1. AIRS_PO2.1, 2016, Resource efficiency.

> Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Recycling of municipal waste

Indicator	Indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Recycling of municipal waste	EU ▲	EEA ▲	50 % of selected materials in household and similar waste to be recycled by each EU Member State — Waste Framework Directive	●
The amount of municipal waste being recycled has been steadily increasing. The outlook for reaching the 2020 target is mixed, with the above level of recycling already achieved by some Member States and others on course to do so. However, the target is some way off for others				

The Seventh Environment Action Programme (7th EAP) contains the objective that waste is safely managed as a resource. This should help Europe to extract more value from the resources it uses, reduce environmental impacts associated with waste management and create jobs. Further increasing recycling rates of municipal waste (household and similar waste from other sources) is an important step in this regard.

The amount of municipal waste being recycled has been steadily increasing in Europe, thanks to investments in appropriate collection and handling, financial incentives to move away from landfilling of waste and landfill bans. The performance of EU Member States on the recycling of municipal waste varies, although the comparability of data is hindered by variation in data collection and definitions. Despite a strong performance from some countries and clear progress being made in nearly all since 2004, in a number of Member States significant efforts are still needed to achieve the 2020 target.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

The 7th EAP states that, by 2020, waste should be 'safely managed as a resource', 'landfilling [is] limited to residual (i.e. non-recyclable and non-recoverable waste)' and 'energy recovery [is] limited to non-recyclable materials' (EU, 2013). The overarching logic guiding EU policy on waste is the waste hierarchy, which prioritises waste prevention, followed by preparation for reuse, recycling, other recovery and finally disposal, including landfilling as the least desirable option. This briefing presents trends on recycling of municipal waste. An improvement in the proportion of waste that is recycled indicates that waste management is moving up the waste hierarchy. Recycling allows the generation of more value from resources and creates jobs. It can also reduce the demand for raw materials and environmental impacts associated with meeting this demand (AIRS_PO2.1, 2016).[1]

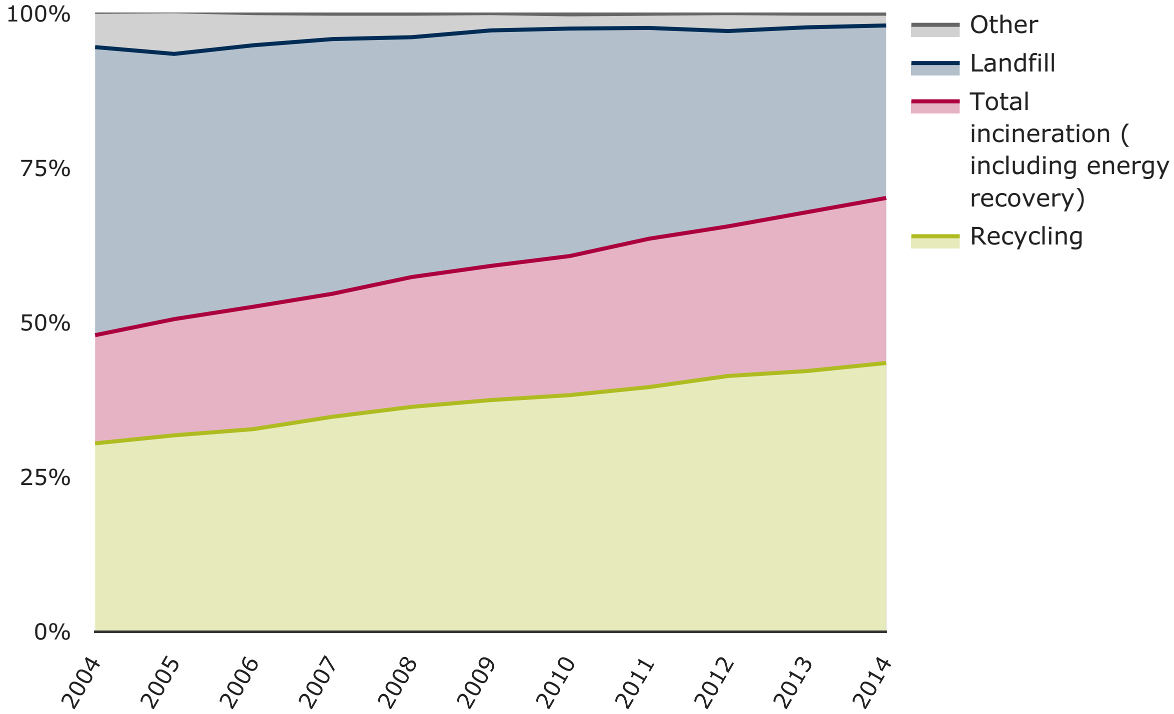
Policy targets and progress

The EU has introduced multiple waste policies and targets since the 1990s. These include strategies, such as the Thematic Strategy on the Prevention and Recycling of Waste (EU, 2005), and framework legislation such as the Waste Framework Directive (EU, 2008). The Waste Framework Directive sets a target for 50 % of at least four fractions (i.e. paper, glass, metals, plastics) of municipal waste to be prepared for reuse or recycled by 2020 in EU Member States. Countries can choose from four alternative calculation methods to measure progress towards the target.

In December 2015, the European Commission published 'Closing the loop — An EU action plan for the circular economy' (EC, 2015), also known as the Circular Economy Package. The package sets out a large number of initiatives, and proposes new targets for municipal waste of 60 % recycling and preparing for reuse by 2025 and 65 % by 2030. These are based on only one calculation method (the one used in Figure 2 of this briefing) with the option of derogations on the timescale for some countries.

As can be seen in Figure 1, for the EU-28 the overall rate of recycling (material recycling, composting and digestion) increased from 30 % in 2004 to 43 % in 2014. This improvement is a combination of a reduction in the amount of municipal waste generated and an increase in the total quantity undergoing material recycling, composting and digestion. This increase is viewed as one of the success stories of environmental policy in Europe so far.

Figure 1. Proportion of municipal waste treated by different methods, EU



Note: The treatment shares relate to waste generated. Recycling of municipal waste includes material recycling and composting/anaerobic digestion. Data for 2004-2006 exclude Croatia. 'Other' includes, inter alia, mass losses during pre-treatment, storage and waste generated but not collected.

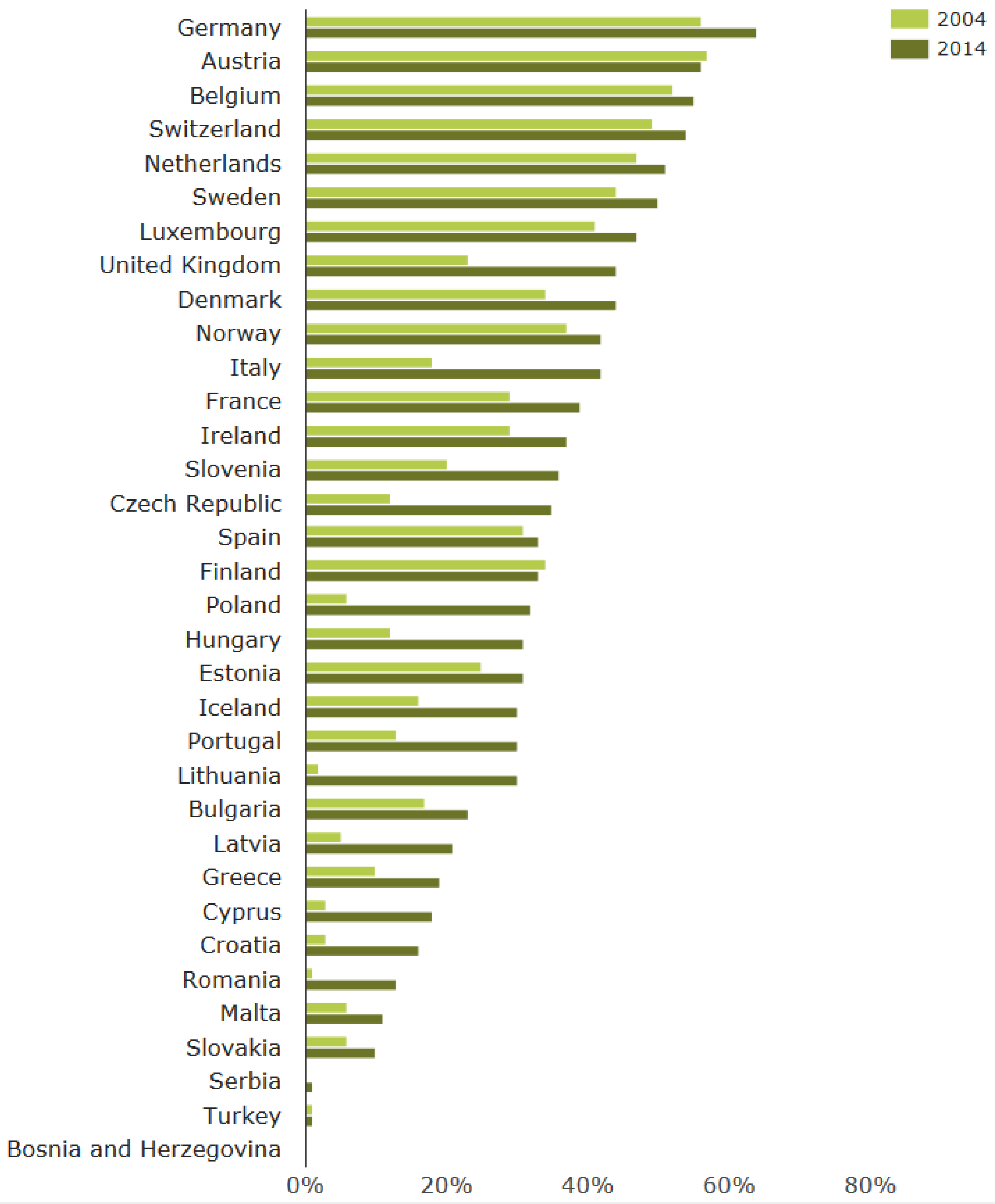
Data sources: Eurostat. Municipal waste by waste operations (env_wasmun)

Figure 1 shows the trend in municipal waste recycling in the context of other municipal waste treatment methods. It is apparent that, as a whole, the EU is moving away from landfilling but that incineration is also growing, with a 44 % increase between 2004 and 2014, compared with a 37 % increase for recycling (including composting and digestion).

Country level information

Despite high (and sustained) levels of municipal waste recycling in some countries and strong improvement in many others, the low rates of recycling and slow progress made in some countries suggest that not every country will achieve the Waste Framework Directive target by 2020.

Figure 2. Municipal waste recycling rate (including composting and digestion) by country



Note: The recycling rate is calculated as the percentage of municipal waste generated that is recycled and composted. Changes in reporting methodology mean that 2014 data are not fully comparable with 2004 data for Austria, Cyprus, Malta, Slovakia and Spain. 2005 data were used instead of 2004 data for Poland because of changes in methodology. On account of data availability, instead of 2004 data, 2003 data were used for Iceland, 2007 data for Croatia, and 2006 data for Serbia; and instead of 2014 data, 2013 data were used for Greece and Ireland, and 2012 data for Turkey. Data for Cyprus, Germany, Luxembourg, Poland and Spain are estimates.

Data sources: a. Eurostat. Municipal waste by waste operations
b. Czech Ministry of the Environment. Waste Management Information System
c. The Environment Agency of Iceland. Waste Management Information System d. EEA – Indicator WST005

EEA countries achieved an average total recycling rate of 34 % in 2014, compared with 24 % in 2004. In the EU-27, it increased from 31 % to 44 % over the same period. There were large differences in performance among those countries with the highest and lowest recycling rates. Germany, Austria, Belgium, Switzerland, the Netherlands and Sweden recycled at least half of their municipal waste in 2014. The highest increase in recycling rates between 2004 and 2014 occurred in Lithuania, Iceland, Poland, Italy, Cyprus, the United Kingdom and the Czech Republic (increases of 20–29 percentage points). Overall, in 15 out of 32 countries, the increase in recycling rates was at least 10 percentage points over this period. However, in six countries the proportion of recycled municipal waste barely changed (Spain, Belgium, Latvia, the Netherlands, Slovakia, Malta and Switzerland (increases of fewer than 5 percentage points) and in three countries (Finland, Austria and Turkey) it decreased.

The recycling rates shown in Figure 2 cannot be used to assess EU Member States' progress against the target of 50 % of waste to be prepared for reuse and recycling set by the Waste Framework Directive, because Member States can choose between four different methods to calculate compliance with the target. Figure 2 shows recycling rates calculated following the most demanding method, i.e. method 4.

Progress in enhancing recycling rates is primarily due to trends in the recycling of materials, with biowaste recycling performing less well. Nineteen countries achieved fairly substantial increases in their material recycling rates, but there was comparatively little change in national biowaste recycling rates (EEA, 2013).

There is a clear link between increasing recycling rates and declining rates of landfilling. In countries with high municipal waste recycling rates, landfilling is declining much faster than recycling is growing, as waste management strategies usually move from landfilling towards a combination of recycling and incineration, and in some cases also mechanical–biological treatment (MBT) (EEA, 2013).

Almost without exception, the countries that are performing better in terms of recycling have a wider range of measures and instruments in place than the poorer performing countries (EEA, 2013). Measures have included landfill bans on biodegradable waste or non-pre-treated municipal waste; mandatory separate collection of municipal waste types, especially biowastes; and economic instruments such as landfill and incineration taxes and waste collection fees that strongly encourage recycling. Producer responsibility, binding recycling targets and obligations to make separate collections have certainly also played a role. Although the key drivers behind better municipal waste management are clearly EU and national policies and targets, regional and local policies within countries also play a significant role (EEA, 2015).

Outlook beyond 2020

The 7th EAP describes a number of steps that are required to achieve its objective of waste being managed as a resource. The Circular Economy Package (EC, 2015), includes a number of proposed targets and measures beyond 2020, which can move the EU towards this vision:

- a common EU target of preparing 65 % of municipal waste for reuse and recycling by 2030;
- a common EU target of preparing 75 % of packaging waste for reuse and recycling by 2030;
- a binding landfill target to reduce landfill to a maximum of 10 % of municipal waste by 2030;
- a ban on landfilling of separately collected waste;
- the promotion of economic instruments to discourage landfilling ;
- simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- concrete measures to promote reuse and stimulate industrial symbiosis — turning one industry's by-product into another's raw material;
- economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electrical and electronic equipment and vehicles).

The success of these targets and measures will be key to the medium- to long-term prospects for achieving an innovative circular economy in which nothing is wasted, as envisaged by the 7th EAP.

About the indicator

This briefing focuses on the recycling of municipal waste. Despite the fact that it represents only around 7 – 10 % of total waste generation in the EU, municipal waste is very visible and its prevention has the potential to reduce environmental impact, not only in the consumption and waste phases but also over the whole life cycle of the products consumed. Municipal waste consists to a large extent of waste generated by households, but it may also include similar wastes generated by small businesses and public institutions that are also collected by municipalities.

Recycling of waste is defined as any recovery operation by which waste materials are reprocessed into products, materials or substances, whether for the original or other purposes. It includes the reprocessing of organic material (e.g. by composting or digesting) but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations (Eurostat, 2015).

The recycling rate is calculated as the percentage of municipal waste generated that is subsequently recycled (including composting and digesting). There are limitations in the comparability of data between countries and over time. There are also variations in what countries classify as municipal waste and, in some cases, these definitions have changed over time. In addition, there is also variation in the calculation method, depending on whether or not the weight of material collected but discarded during the recycling process is included.

Finally, the indicator shows the recycling rate of municipal waste calculated using a consistent method, although Member States can choose between four different methods to monitor recycling rates in order to meet the target of 50 % of waste to be prepared for reuse and recycling (EEA, 2015).

Footnotes and references

EC, 2005, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions 'Taking sustainable use of resources forward: A thematic strategy on the prevention and recycling of waste' (COM(2005) 666 final).

EC, 2015, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Closing the loop — An EU action plan for the circular economy' (COM(2015) 614 final) (http://ec.europa.eu/environment/circular-economy/index_en.htm), accessed 14/10/16.

EEA, 2013,Managing municipal solid waste — A review of achievements in 32 European countries, EEA Report No 2/2013, European Environment Agency.

EEA, 2015, Waste — Municipal solid waste generation and management, SOER briefing, European Environment Agency (http://www.eea.europa.eu/soer-2015/countries-comparison/waste#note3), accessed 14/10/16.

EU, 2008, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives (OJ L 312, 22.11.2008, p. 3–30).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annexe A, paragraph 43(d) (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2015, 'Recycling of waste' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Recycling), accessed 14/10/16

AIRS briefings

1. AIRS_PO2.1, 2016, Resource efficiency, European Environment Agency

> Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Freshwater use

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Use of freshwater resources	▲	Water abstraction should stay below 20% of available renewable freshwater resources — Roadmap to a resource efficient Europe	●
While efficiency gains have been achieved, hotspots for water stress conditions are likely to remain given continued pressures such as climate change, increasing population and rapid urbanisation			

The Seventh Environment Action Programme (7th EAP) aims to ensure that, by 2020, water stress (lack of water) is prevented or significantly reduced in the EU. Water is an essential component for preserving biodiversity and maintaining other freshwater ecosystem services such as public water supply. Freshwater also serves as a vital input to economic activities across Europe, including agriculture, tourism and industrial activities.

While freshwater is relatively abundant in Europe, water availability and socio-economic activity are unevenly distributed, leading to major differences in water stress levels across the continent. With the exception of some northern and sparsely populated areas that possess abundant freshwater resources, water stress occurs in many areas of Europe, particularly in the Mediterranean and parts of the Atlantic region, because they are confronted with a difficult combination of both a severe lack of freshwater and a high demand for it.

In general, a decrease in water abstraction in Europe has been observed for some economic sectors since the 1990s, mainly due to efficiency gains in industry and agriculture. On the other hand, little improvement has been achieved in water abstraction for public water supply. Between 2002 and 2012, water abstraction from freshwater resources has decreased by around 7 % in Europe. However, there are differences in trends observed across Europe, with water abstraction decreasing in eastern and western Europe and a slight increase in southern Europe.

While efficiency gains in industrial and agricultural water use, as well as in public networks, have been achieved and are likely to continue to improve in the period to 2020, hotspots for water stress conditions are likely to remain, given continued pressures such as climate change, increasing population and rapid urbanisation. However, because other drivers and pressures influencing both water demand and freshwater availability (e.g. consequences of climate change, increasing population and rapid urbanisation) are expected to intensify, it remains uncertain whether or not water stress can be prevented or significantly reduced. It is therefore important that water abstraction respects available renewable resource limits in order to prevent or significantly reduce water stress.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

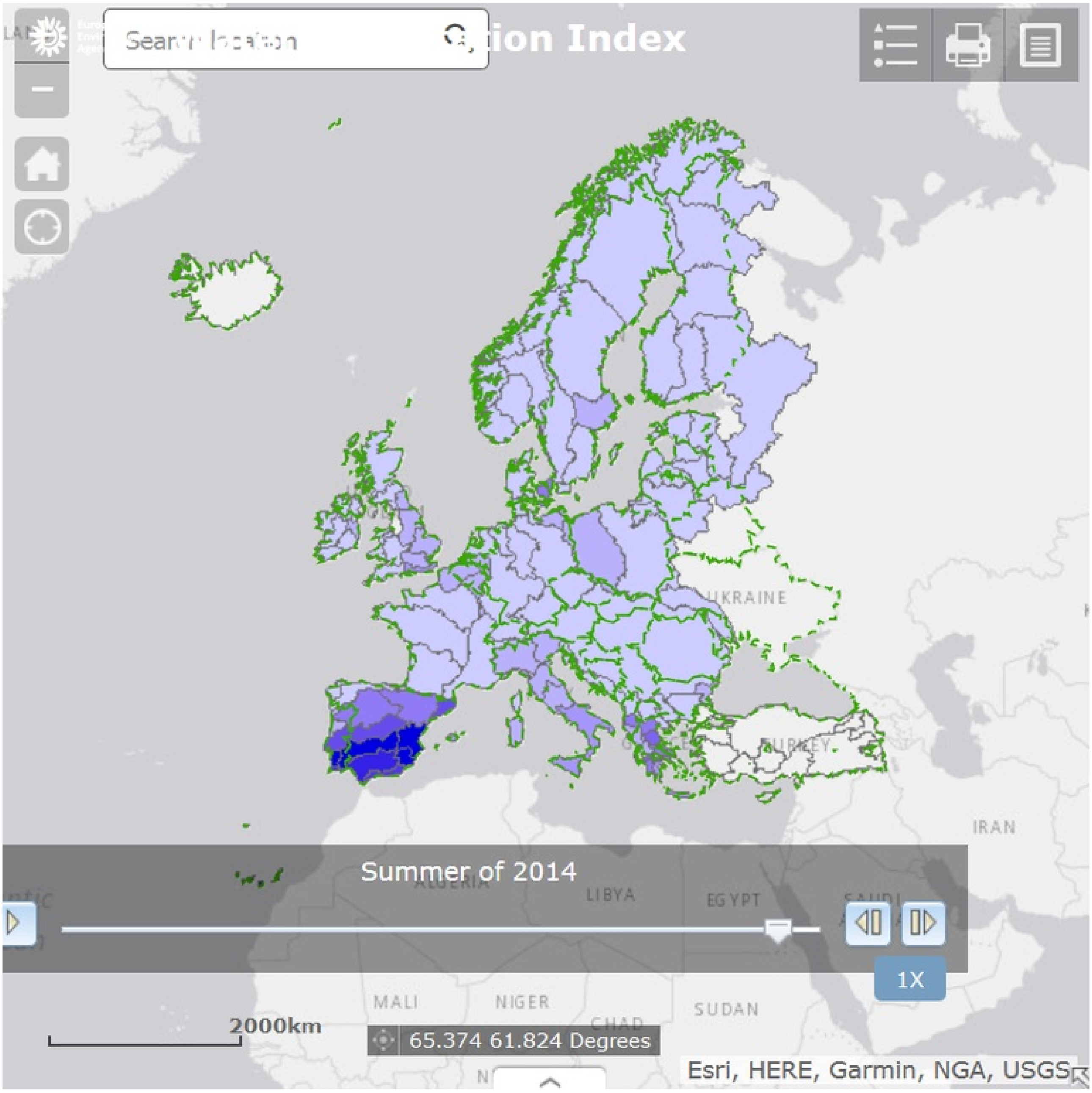
The 7th EAP aims to ensure that, by 2020, water stress (stress on available water resources) is prevented or significantly reduced in the European Union (EU, 2013). This briefing presents trends in the use of freshwater resources. Water is an input to key economic sectors such as agriculture, tourism and industry, and it is an essential component for preserving biodiversity and maintaining other freshwater ecosystem services such as public water supply. It is therefore important that water use (as measured by the Water Exploitation Index plus (WEI+)) respects the limits of available renewable freshwater resources and that water stress be prevented or significantly reduced.

Policy targets and progress

The EU's Roadmap to a Resource Efficient Europe (EC, 2011) includes a milestone for 2020 that 'water abstraction should stay below 20 % of available renewable freshwater resources'. As quantity and quality of water are closely linked, achieving 'good' status under the Water Framework Directive (see Surface waters briefing, AIRS_PO1.9, 2016)[1] also requires ensuring that there is no overexploitation of water resources.

While freshwater is relatively abundant in Europe (EEA, 2015), water availability and socio-economic activity are unevenly distributed, leading to major differences in water stress levels across the continent. Except in some northern and sparsely populated areas that possess abundant freshwater resources, water stress occurs during the summer months in many areas of Europe, in particular in densely populated areas and the Mediterranean (Figure 1). Almost 17 % of total renewable freshwater resources are abstracted in those regions, which are confronted with a difficult combination of a severe lack of freshwater and a high demand for it.

Figure 1. Water Exploitation Index plus for Europe, 2014



Source:
a) The European Pollutant Release and Transfer Register (E-PRTR), Member States reporting under Article 7 of Regulation (EC) No 166/2006, b) Waterbase - UWWTD: Urban Waste Water Treatment Directive – reported data , c) Waterbase - Water Quantity, d) European catchments and Rivers network system (Ecrins).

Note:
The Water Exploitation Index Plus has been calculated at the sub basin scale on seasonal resolution and then aggregated to river basin district scale. The reference year is 2014 (Q1: January, February, March; Q2: April, May, June; Q3: July, August, September; Q4: October, November, December). The spatial reference data used when estimating the WEI+ is the ECRINS (European catchments and rivers network system). The ECRINS delineation of sub basin and river basin district differ from those defined by Member States under the Water Framework Directive, particularly for transboundary river basin districts. Click on **more info** to see time series in WEI+ including level of sectorial pressures over freshwater resource

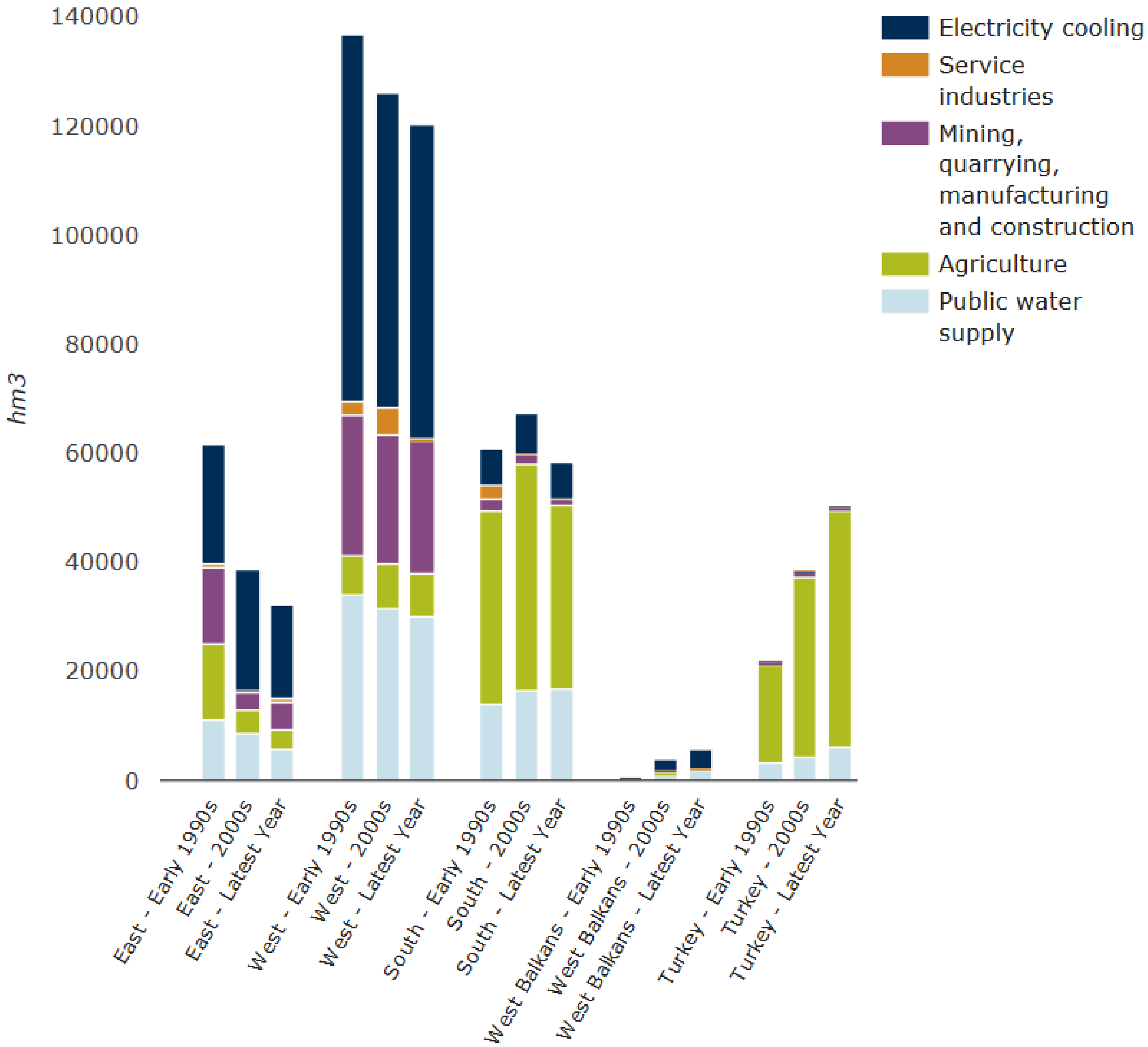
Rivers and groundwater aquifers supply more than 80 % of the total water used in Europe annually. Around 17 river basin districts, mainly in Spain, Malta, Cyprus, Greece, Portugal Poland and the United Kingdom experienced water stressed conditions during the summer months in 2014. This was due to relatively low net precipitation with large variations within and between years combined with their inability to draw on more distant water sources, as well as intense tourism activities. In addition, near-shore freshwater aquifers are threatened by seawater intrusion. The situation is worse in summer, when average precipitation is very low and water demand for agriculture and tourism is high. This makes water resource management, particularly on the Mediterranean islands, challenging.

Summer is the period when most water stress occurs. This is due to a combination of factors. Water availability decreases because of hotter and drier conditions, while water abstraction doubles during the summer compared with winter, because people and sectors, such as agriculture and industry, require more freshwater, e.g. for cooling and irrigation. During winter only around 7 % of the total area of Europe experiences water stress conditions, whereas this rate reaches 11 % in summer. The highest WEI+ for the 2014 summer period was estimated for Spanish and Portuguese islands, Malta, Cyprus (81 %), the Jarft river basin in Poland (67 %) followed by the Segura river basin in Spain (62 %).

Across Europe, water abstraction from surface water resources accounts for 58 % of total water use, with the remaining 42 % coming from ground water. The WEI+ is driven by two important factors: (1) climate, which controls water availability and seasonality in water supply, and (2) water demand, which is largely driven by the population density and related economic activities. Thus, a strong relationship exists between this indicator and water use by economic sectors.

In general, a decrease in water abstraction in Europe has been observed for some economic sectors since the 1990s (Figure 2). In the EU-27 (plus Iceland, Norway and Switzerland), the industrial sector has improved its water efficiency, leading to a significant decrease (28 %) in water abstraction over this period. Agriculture has achieved a 7 % decrease in water abstraction, yet remains the sector with the highest water demand. Water abstraction for electricity has decreased by 11 % since the 1990s, indicating a more or less constant trend since 2000. Little improvement has been achieved in water abstraction for public water supply, where there has been only a 3 % decrease since the 1990s.

Figure 2. Development of water abstraction across Europe by sector since the 1990s



Notes:
Turkey is plotted as an individual column in this graph to illustrate the large increase in its water use for agriculture.

- East: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania*, Hungary, Poland, Romania, Slovenia, Slovakia
- South: Greece, Spain, Italy*, Cyprus*, Malta, Portugal*
- West: Belgium, Denmark, Germany, Ireland*, France, Liechtenstein, Luxembourg, the Netherlands, Austria, Finland, Sweden, England and Wales, Iceland, Norway, Switzerland*
- Western Balkans: Croatia, Montenegro, the former Yugoslav Republic of Macedonia, Albania, Serbia, Bosnia and Herzegovina, Kosovo under UNSCR 1244/99

* Water abstractions data are not available for all sectors and periods.

Data sources: a. Eurostat. Annual freshwater abstraction by source and sector b. EEA – Indicator WAT001

The long-term vision of the 7th EAP is of an innovative economy in which natural resources are managed sustainably. This includes water resources. However, in the coming years, the consequences of various drivers and pressures including climate change, increasing population and continued urbanisation of floodplain areas will increase the likelihood of flooding, droughts and water scarcity in some regions of Europe. There are many indications that water bodies already under stress are highly susceptible to climate change impacts, and that climate change may hinder attempts to restore some water bodies to good status.

While, efficiency gains in industrial and agricultural water use, as well as in public networks, have been achieved and are likely to continue to improve in the period to 2020, hotspots for water stress conditions are likely to remain. If the area under water stress is to be reduced, additional improvements to water efficiency in all sectors will be needed, but particularly the largest consuming sectors, agriculture and the public water supply. However, water efficiency improvements alone are unlikely to be sufficient to offset all the additional impacts of climate change on water scarcity in the future. It is therefore likely that water stress will continue to increase beyond 2020.

About the indicator

This indicator, commonly known as the WEI+, aims to illustrate water use. It shows the percentage used of the total renewable freshwater resources available. A WEI+ above 20 % implies that a water resource is under stress, and more than 40 % indicates severe stress and clearly unsustainable use of the resource (Raskin et al., 1997).

WEI+ data are available at fine spatial (e.g. sub-basin or river basin) and temporal (monthly or seasonal) scales to better capture local and seasonal variation in the pressure on renewable freshwater resources. The indicator focuses on water quantity. For some aspects of freshwater quality, see the Surface waters briefing (AIRS_PO1.9, 2016).[1]

Data on water use have also been derived from various sources such as WISE 3, EPRT-R, UWWTPs, Eurostat water data which have been integrated in the EEA water accounts production database. The methodology and latest assessment has a special focus on water use by economic sectors (see EEA, 2016).

Footnotes and References

EC, 2011, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 'Roadmap to a Resource Efficient Europe', section 4.4 (SEC(2011) 1067 final) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0571&from=EN).

EEA, 2015,Hydrological systems and sustainable water management, SOER briefing, European Environment Agency (http://www.eea.europa.eu/soer-2015/europe/hydrological-systems).

EEA, 2016, 'Report on European water quantity accounts and use of freshwater resources (CSI 018)', 2016 update, European Environment Agency, forthcoming.

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annex A, paragraph 43(e) (OJ L 354, 28.12.2013, p. 171–200).

Raskin, P., Gleick, P.H., Kirshen, P., Pontius, R.G. Jr and Strzepek, K., 1997,Comprehensive assessment of the freshwater resources of the world, Stockholm Environmental Institute, Stockholm, Sweden. Document prepared for UN Commission for Sustainable Development 5th Session 1997 — Water stress categories are described on pages 27–29.

Briefings

1. AIRS_PO1.9, 2016, Surface waters, European Environment Agency

> Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Greenhouse gas emissions

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Total greenhouse gas emission trends and projections	▲	Reduce greenhouse gas emissions by 20% compared with 1990 levels - 2020 Climate and Energy Package	●
The decreasing trend of greenhouse gases and the future evolution as projected by the EU Member States indicate that the 2020 greenhouse gas emissions reduction target will be met			

The Seventh Environment Action Programme (7th EAP) supports the objective of reducing EU greenhouse gas emissions by 20 % (compared with 1990) by 2020. The EU also has a longer term objective of reducing greenhouse gas emissions by 80 – 95 % by 2050 and an agreed target of a 40 % reduction by 2030 (compared with 1990 levels).

Emissions projections indicate that Europe should meet its 2020 greenhouse gas emissions reduction target. In spite of a slight increase in 2015, total EU greenhouse gas emissions (including international aviation) were in 2015 22 % below the 1990 levels, therefore well below the 2020 target. According to national projections aggregated at EU level, greenhouse gas emissions are expected to decrease further by 2020. In the longer term, EU Member States expect that the pace of these reductions will slow and planned reductions will result in EU emissions of between only 26 % and 29 % below 1990 levels by 2030, falling short of the 40 % reduction target. However, these projections do not reflect the latest EU-level policy developments that are linked to the implementation of the recently endorsed 2030 target.

The main reasons for the observed reductions in greenhouse gas emissions are a reduction in the energy intensity of the economy, switching to less carbon-intensive fuels, and an increase in the use of renewable energy sources. Weather conditions and the economy have also played important roles in the overall reductions in greenhouse gas emissions.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the scene

The 7th EAP includes the objective for the EU to meet its 2020 climate and energy targets and to work towards reducing greenhouse gas emissions by 80 – 95 % by 2050, compared with 1990 levels (EU, 2013). Greenhouse gas emissions are the primary cause of climate change. Climate change will further aggravate environmental problems by causing prolonged droughts and heatwaves, floods, storms, forest fires, and soil and coastal erosion, as well as new or more virulent forms of human, animal or plant disease. Climate change is also expected to significantly increase the pressure on Europe's water resources.

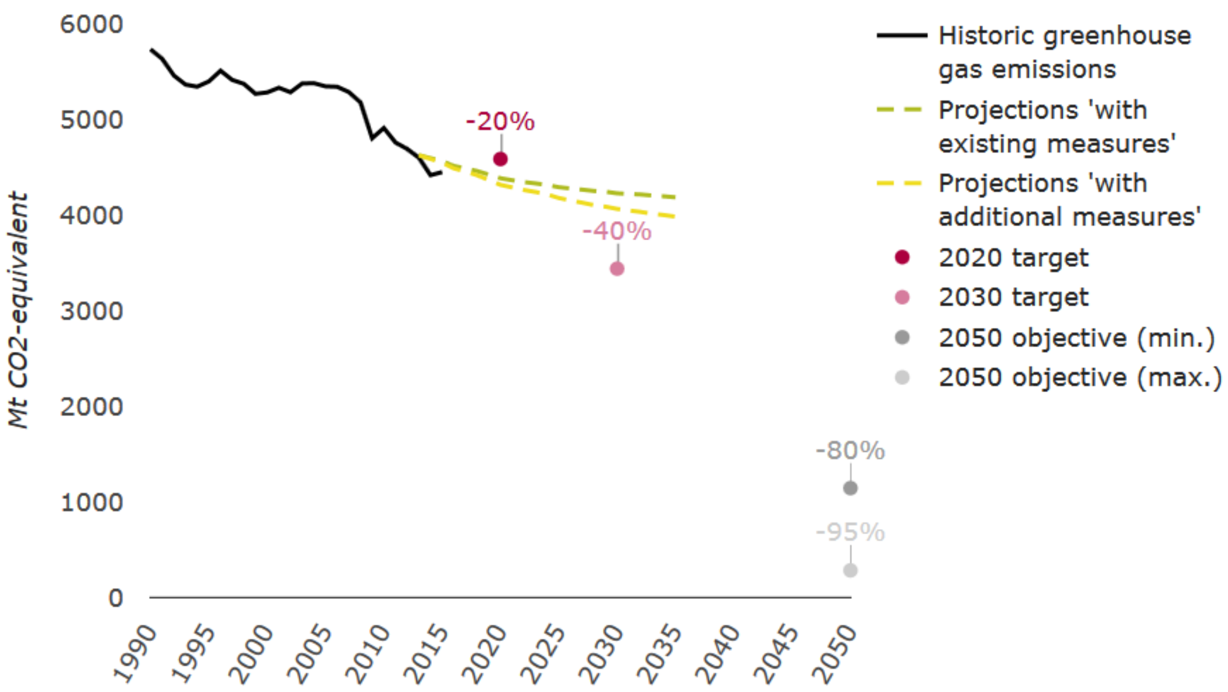
Policy targets and progress

The EU has committed to achieving a reduction in its greenhouse gas emissions of at least 20 % by 2020, compared with 1990 levels (EEA, 2016a). This objective is embodied in both European and international commitments and targets, which clearly align with the objectives of the 7th EAP described above.

The overall emissions reduction target is separated into one EU-wide target for large industrial installations, covered by the European Union Emissions Trading System (EU ETS) and 28 binding national targets for all the emissions that are not in the EU ETS. These national targets, set under the Effort Sharing Decision (ESD), cover sectors such as households, buildings, transport, agriculture, services, waste and smaller industrial installations. The EU ETS is expected to deliver a 21 % reduction in its emissions, and the non-ETS sectors should reduce emissions by 9 % by 2020 (both compared with 2005 levels). Together, these will lead to a reduction of 20 % in overall greenhouse gas emissions by 2020 compared with 1990 levels.

Within the ETS system, the EU sets limits on emissions from high-emitting industry sectors. With these limits as a reference, companies can buy and sell emission allowances as needed. This 'cap-and-trade' approach gives companies the flexibility they need to cut their emissions in the most cost-effective way. The EU ETS covers more than 11 000 power stations and manufacturing plants in the 28 EU Member States, as well as in Iceland, Liechtenstein and Norway. Emissions from commercial aircraft flying within and between most of these countries are also covered. In 2014, EU ETS emissions represented around 42 % of total EU greenhouse gas emissions.

Figure 1. GHG emission trends, projections and targets in the EU, 1990-2050.



Notes:
- According to the scenario 'with existing measures' (WEM), which reflects the effects of all adopted and implemented measures at the time the projections were prepared, GHG emissions will be reduced by 23% by 2020 and by 26% by 2030, compared with 1990 levels. According to the scenario 'with additional measures' (WAM), which also takes into account the measures that were at planning stage at the time the projections were prepared, GHG emissions will decrease by 25% by 2020 and by 29% by 2030, compared with 1990 levels.
- Historic trends from 1990 to 2015 are represented in solid lines.The 2014–2015 trend is approximated (preliminary estimates). Projections from 2013 until 2035 are represented in dashed lines.The upper line represents the scenario "with existing measures", while the lower line represents the scenario "with additional measures". EU targets and objectives for 2020, 2030 and 2050 are represented as bullets.
- EU targets and goals are expressed against 1990 levels

Data sources: a. EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism b. EEA. Approximated greenhouse gas emissions c. EEA. Greenhouse gas projections d. EEA – Indicator CLIM050

In 2015, EU greenhouse gas emissions were already 22 % below 1990 levels (see Figure 1). Preliminary greenhouse emission estimates indicate an expected 0.7 % increase for 2015 (EEA, 2016b). This follows an exceptional 4.0 % reduction the previous year, which was due to a particularly warm winter. Emissions from industries in the EU Emissions Trading System (ETS) continued to decrease in 2015. On the other hand, emissions not included in the ETS increased. In particular, transport emissions increased for the second year in a row.

The EU has improved its energy intensity over time. This has been because of energy efficiency improvements, structural changes in the economy and reduced energy consumption as a result of the 2008 economic downturn (for more information, see the Energy efficiency briefing (AIRS_PO2.7, 2016)[1]). This trend is primarily responsible for the reductions in greenhouse gas emissions observed in the EU between 2005 and 2013 (EEA, 2014). Reductions in greenhouse gas emissions can also be attributed to a change in the mix of fossil fuels used and the increasing use of carbon-free energy sources, including renewable energy sources (RES) (for more information, see the Renewable energies briefing (AIRS_PO2.9, 2016)[2]), reflecting the effects of policies and measures supporting the deployment of RES (e.g. feed-in tariffs), the establishment of a carbon price through the EU ETS, and external factors such as fluctuations in fossil fuel prices (EEA, 2015a). The strong growth in the use of RES — particularly wind, solar and biomass — and the resulting increased proportion of RES in electricity production have also contributed to the reduction in emissions. Demand for energy to heat households was also lower during this period, as Europe has experienced milder winters on average since 1990 (EEA, 2015a, 2016b and 2016c).

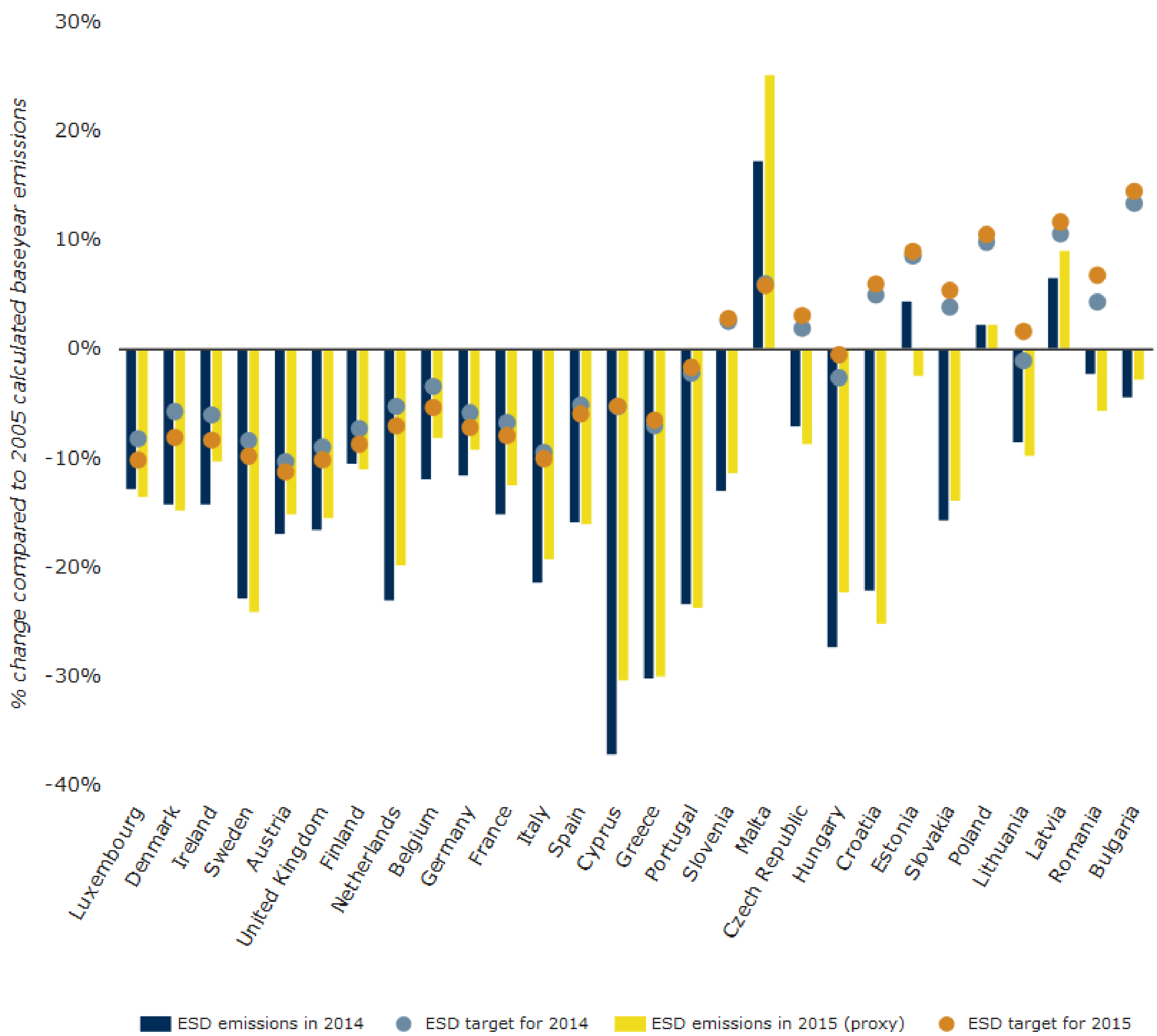
As projected by the EU Member States, emissions are expected to decrease further to 23% by 2020 with the current measures that are already in place. Additional measures (currently planned by Member States) could further reduce emissions to almost 25 % below 1990 levels. Most of the savings in greenhouse gas emissions are expected to take place as a result of the EU ETS (EEA, 2015a).

Country level information

To meet the 2020 GHG target, the EU adopted a climate and energy package in 2009, comprising a legislative set of binding targets, which defined a single target for all EU emissions covered by the EU Emissions Trading System (ETS) and a set of national targets for all other emissions not covered by the EU ETS. Since 2005, which was the first year of operation of the EU ETS, the ETS sectors have seen reductions in emissions of approximately 24 %. The main sectors that experienced particularly large decreases in emissions were cement clinker and lime. Reductions in emissions from combustion installations, which represent more than 70 % of all ETS emissions and are dominated by electricity generation, are largely as a result of changes to the mixture of fuels used to produce heat and electricity. The use of hard coal and lignite fuels in electricity generation has declined since 2005 and electricity generation from renewable sources has increased considerably. The reduction in emissions may also have been enhanced as a result of improvements in transformation efficiency for electricity generation, which means that less primary energy was necessary to generate a constant quantity of electricity. The cement, lime and iron and steel sectors follow similar trends, with emissions increasing up to 2007 and then decreasing. These reductions in emissions were, to a large extent, driven by reduced production as a result of the economic downturn.

In contrast to the sectors in the EU ETS, which are regulated at EU level, it is the responsibility of EU Member States to define and implement national policies and measures to limit emissions from the sectors covered by the ESD, the residential and commercial, transport, agriculture, waste and smaller industrial installation sectors. In 2014, greenhouse gas emissions from the ESD sectors represented approximately 58 % of total EU greenhouse gas emissions.

Figure 2. GHG emissions under the Effort Sharing Decision, by country



Data sources: a. EEA. Approximated greenhouse gas emissions b. European Commission. Verified emissions under the EU ETS c. EEA. 2014 greenhouse gas emissions covered by Decision 406/2009/EC (the ESD) d. EEA. Commission Decision 2013/162/EU e. EEA. Commission Implementing Decision 2013/634/EU f. EEA – Indicator CLIM050

The national emissions targets for 2020 range from a 20 % reduction in emissions (compared with 2005 levels) to a 20 % increase. Less wealthy countries are allowed emission increases in the ESD sectors, because their relatively higher economic growth is likely to be accompanied by higher emissions. Nevertheless, their targets represent a limit on their emissions compared with the emissions projected using business-as-usual growth rates. All Member States are therefore required to make an effort to reduce emissions (EC, 2015).

Examples of potential policies and measures that could be implemented to reduce emissions include reducing transport demand, promoting public transport, a shift away from transport based on fossil fuels, support schemes for the retrofitting of building stock, more efficient heating and cooling systems, renewable energy for heating and cooling, more climate-friendly farming practices and the conversion of livestock manure to biogas (EC, 2015).

The assessment of current progress towards the ESD targets compares the non-ETS emissions for each year with the annual national targets. In 2014, all Member States but one (Malta) were below their national ESD targets. The 2015 proxy data seem to confirm this trend across the EU (Figure 2).

National projections show that, in most Member States, ESD emissions will remain below annual ESD targets until 2020. However, in five Member States (Austria, Belgium, Denmark, Ireland and Luxembourg) emissions in 2020 could exceed targets if no additional measures are implemented.

Outlook beyond 2020

The EU has also adopted a long-term goal for 2050 of reducing Europe's greenhouse gas emissions by 80 – 95 % compared with 1990 levels. To ensure that the EU is on a cost-effective track towards meeting this objective, in 2014 the European Council adopted a new set of climate and energy targets for 2030 (EC, 2014). This includes a binding target of reducing emissions by at least 40 % compared with 1990 levels.

Looking towards 2030, projections from Member States show that both the current measures in place and the additional national measures that were in the planning stage at the time when projections were made will not be able to deliver sufficient savings to enable the EU to achieve the reduction target of 40 % below 1990 levels (Figure 1). The pace of greenhouse gas emission reductions is projected to slow down after 2020, despite the fact that mid- and long-term targets will require more rapid reductions. Existing policies and measures are expected to result in a reduction in emissions of 26 % by 2030, compared with 1990 levels, and the implementation of additional measures could increase this reduction to 29 %.

Because of this projected shortfall, new policies and measures are currently being developed at EU level to further reduce greenhouse gas emissions. These policy options include measures applicable to the transport and land use sectors, as well as the reform of the ETS, which includes a more stringent cap to achieve reductions beyond 2020, as well as a post-2020 ESD and measures to enhance energy efficiency based on the 2030 framework for climate and energy policies.

About the indicator

The indicator presents past and future trends for anthropogenic greenhouse gas emissions in Europe. In line with the United Nations Framework Convention on Climate Change (UNFCCC) and IPCC reporting guidelines, the indicator covers the following greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). These are weighted by their global warming potential, aggregated and presented in CO_2-equivalent units. The list of gases does not include the greenhouse gases that are ozone-depleting substances and are controlled by the Montreal Protocol. The indicator covers emissions from international aviation and excludes emissions or removals from land use, land use change and forestry (LULUCF) and international shipping. For the past, the indicator uses the greenhouse gas inventory and ETS data. It also uses projection data reported by EU Member States in two scenarios: a ‘with existing measures’ (WEM) scenario and a ‘with additional measures’ (WAM) scenario. The WAM scenario takes into account measures planned but not yet adopted. However, not all EU Member States reported a WAM scenario, so the predicted reduction might not take all planned measures into account and therefore may be an underestimate.

Footnotes and references

EC, 2014, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘A policy framework for climate and energy in the period from 2020 up to 2030’ (COM(2014) 15 final of 22 January 2014).

EC, 2015, ‘Effort sharing decision’ (http://ec.europa.eu/clima/policies/effort/index_en.htm).

EEA, 2014,Trends and projections in Europe 2014 — Tracking progress towards Europe’s climate and energy targets until 2020, EEA Report No 6/2014, European Environment Agency.

EEA, 2015a,Trends and projections in Europe 2015—Tracking progress towards Europe’s climate and energy targets, EEA Report No 4/2015, European Environment Agency.

EEA, 2016a, Background information - Domestic climate and energy targets in the EU, European Environment Agency (http://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/background-information-domestic-climate-and) accessed 21 November 2016.

EEA, 2016b, Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets, European Environment Agency (http://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/) accessed 21 November 2016.

EEA, 2016c, Analysis of key trends and drivers in greenhouse gas emissions in the EU between 1990 and 2014, European Environment Agency (http://www.eea.europa.eu/publications/analysis-of-key-trends-ghg/) accessed 4 July 2016.

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 ‘Living well, within the limits of our planet’ Annex A, paragraph 43(a) (OJ L 354, 28.12.2013, p. 171–200).

Briefings

1. AIRS_PO2.7, 2016, Energy efficiency,European Environment Agency .
2. AIRS_PO2.9, 2016, Renewable energies,European Environment Agency .

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Renewable energies

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Share of renewable energy in gross final energy consumption	▲	Reach a 20% share of renewable energy in gross final energy consumption - Renewable Energy Directive	●
The EU has steadily increased the share of renewable energy in its gross final energy consumption. If the current pace of growth is maintained, the 2020 renewable energy target will be met			

The Seventh Environment Action Programme (7th EAP) supports the EU's objective of meeting the 20 % renewables target by 2020. The Renewable Energy Directive specifies that, by 2020, 20 % of the EU's gross final energy consumption must be renewable. The EU has steadily increased the contribution of renewable energy sources to gross final energy consumption thanks to dedicated national support schemes and significant cost reductions achieved by some renewable energy technologies. This trend continued in 2014, although the pace of progress was slightly reduced by cuts in feed-in tariffs in some Member States and deteriorating market conditions due to the persistent economic downturn in others. Analysis of the EU Member States' renewable energy action plans shows that if they follow their plans, the EU 2020 renewables target will be achieved. As the current unfavourable economic climate in Member States has led to considerable uncertainty about the future of support mechanisms for renewables, further action may be necessary to ensure that the EU remains on target.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the scene

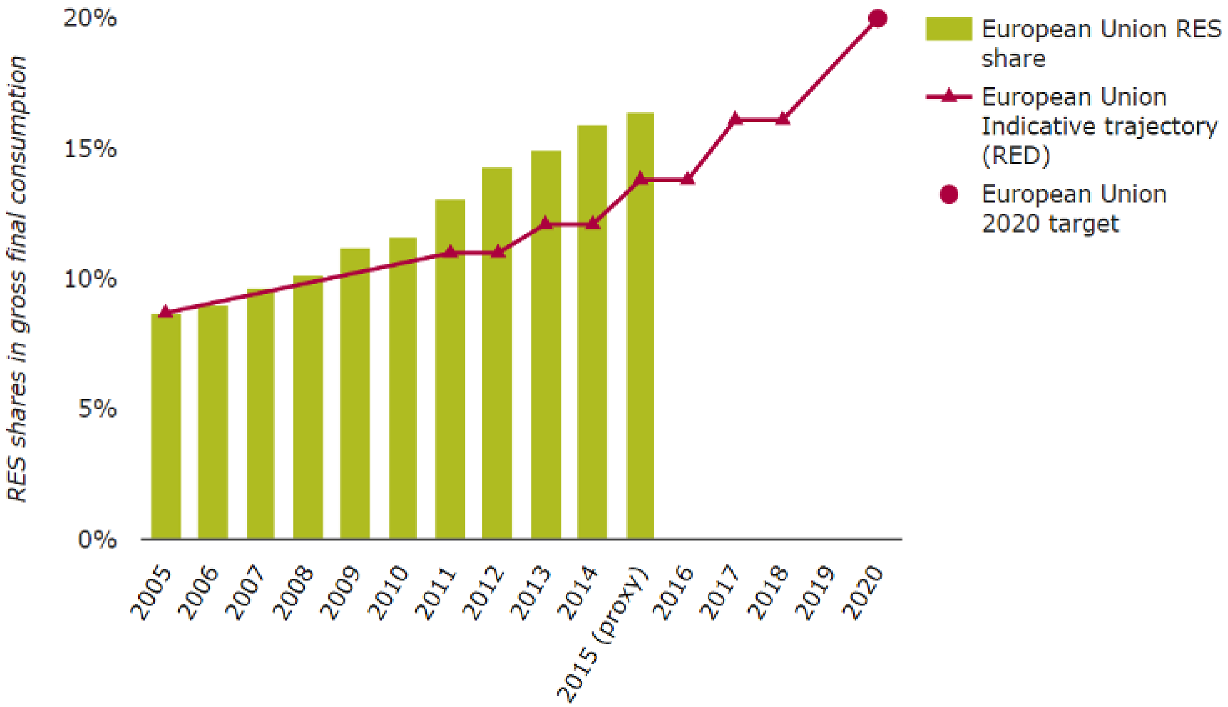
The 7th EAP supports the EU's objective of meeting its 2020 renewable energy target, as stipulated in the Renewable Energy Directive (EU, 2013). In comparison with fossil fuels, using renewable energy results in reduced greenhouse gas and air pollutant emissions, reduced environmental and health impacts, and a reduced dependency on energy imports.

Policy targets and progress

The Renewable Energy Directive (EU, 2009) commits the EU to reaching 20 % of renewable energy in gross final energy consumption by 2020. It sets binding national targets for renewable energy consumption in 2020 and it prescribes for each Member State minimum indicative trajectories in the run-up to 2020 to ensure that national targets will be met.

The Directive also requires Member States to adopt national renewable energy action plans that outline expected trajectories for the national share of renewable energy sources (RES) from 2010 to 2020. It also requires Member States to report every 2 years on progress towards the indicative trajectories of the Directive as well as towards the trajectories that they have set themselves in their action plans.

Figure 1. Share of renewable energy in gross final energy consumption, EU-28



Data sources: a. European Commission. National renewable energy action plans b. Eurostat. SHARES Results 2014
c. EEA – Indicator ENER028

Note: Share results 2014

As can be seen in Figure 1, the proportion of renewable energy increased continuously between 2005 and 2014, with an annual compound growth rate of 7 %, to reach 15 % in 2013 and 16 % in 2014 (EEA, 2015a). This has put the EU well on the path to meeting its target. The increase has been more rapid than the target path. The increase was mainly the result of various support schemes that were put in place by Member States, such as feed-in tariffs, feed-in premiums, auction/tender systems, quotas, tax credits and grants.

Shrinking production costs due to the scaling up of global production volumes and technological advances have also played an important role (EC, 2015). Photovoltaics (technologies that transform solar energy to electricity) have experienced the largest reduction in costs, with costs per kilowatt hour decreasing by 53 % between 2010 and 2014 (UNEP, 2014). Electricity from onshore wind turbines became 15 % cheaper during the same period (UNEP, 2014). Lower final energy consumption has also helped the EU to increase its renewable energy share (see EEA, 2016, and the EEA's final energy consumption indicator, CSI 027) because, if final energy consumption is lower, a lower overall quantity of energy is required from renewables to meet the target.

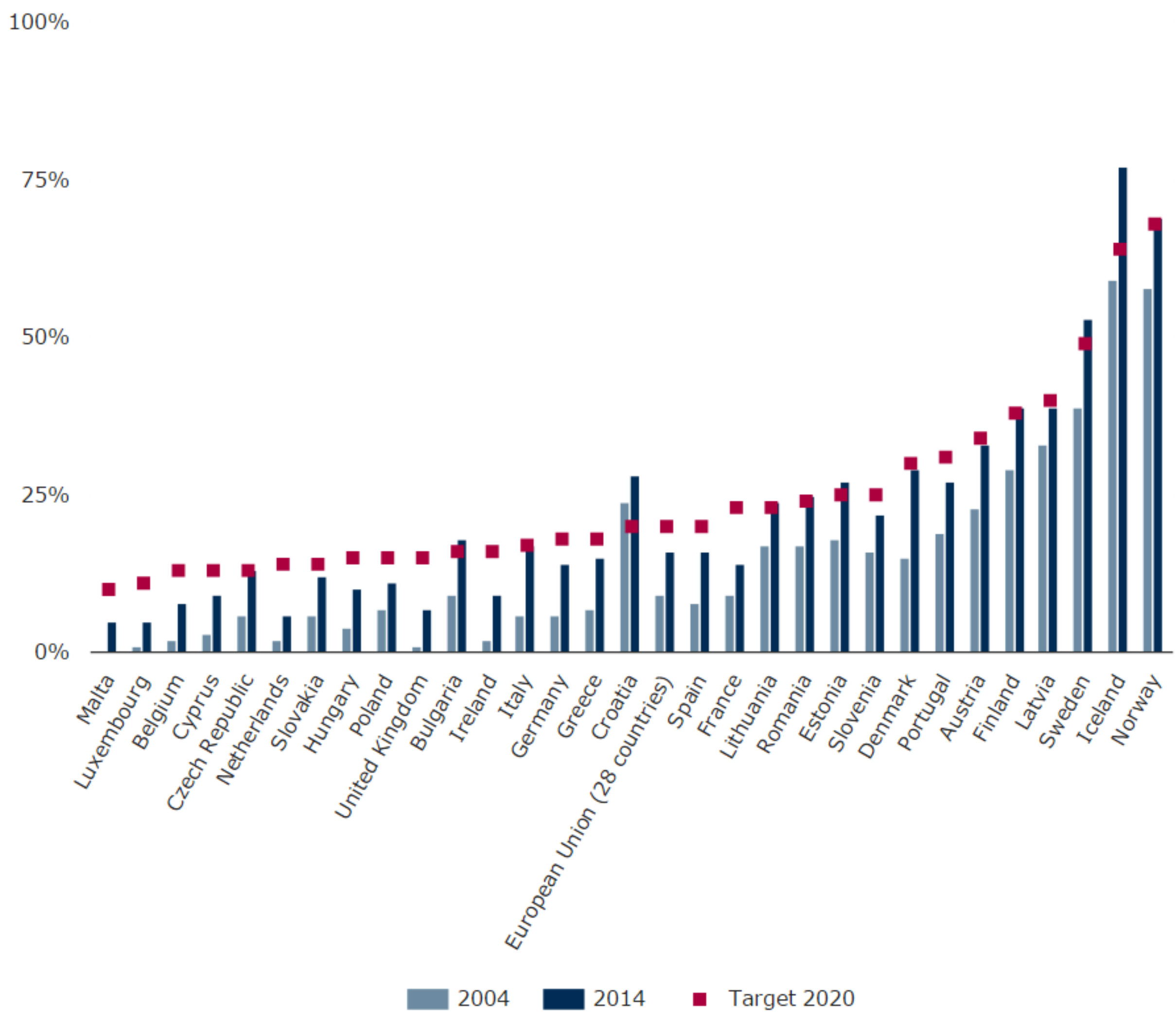
If Member States fully deliver on their national renewable energy action plans, the EU will slightly over-achieve its target (by about 1 percentage point) (EEA, 2015b). Wind power, solar electricity and biofuels for transport are expected to have the highest growth rates to 2020 (UNEP, 2014). This was also the case during the 2005–2014 period, in particular with respect to wind and solar electricity. In absolute terms, however, hydropower and biomass (for heat generation) will remain the most important single RES, despite a decrease in their contribution to the overall energy produced by renewable sources. In 2012, hydropower accounted for 17 %, and biomass and waste for 64 %, of final renewable energy consumption.

While EU countries still lead the world in total installed renewable capacity, the EU is losing ground to China, Japan and the United States with respect to new installations (EEA, 2016). The EU was the region with the highest RES investments every single year from 2005 to 2012, surpassed by China only in 2013 (UNEP, 2014); this shows that the EU played a leading role in the development of renewables in their early stage, and for the global roll-out of RES. Of world regions with sufficient data availability, the EU came third in per capita employment in the area of renewable energy in 2014 (EEA, 2016). However, in 2013, EU investment in renewables slumped by 44 % compared with the previous year. This reflected not only lower costs but also uncertainty about the future of support mechanisms and lower investment capacity due to the persistent economic downturn in some EU countries (UNEP, 2014). Feed-in tariffs, an effective renewable energy support scheme, were drastically cut in 2012 and 2013 in some Member States. In some cases these changes were applied retroactively, i.e. to existing plants (EC, 2015). Policy uncertainty increases the costs of renewable energy installation and makes Europe a less attractive prospect for investors and renewable energy developers (UNEP, 2014). This has already been observed in the solar power industry. The strong growth in the renewable energy sector in Europe is picked up in the Environmental goods and services sector briefing (AIRS_PO2.12)[1] and the Environmental protection expenditure briefing (AIRS_ PO2.13).[2]

Given this context, further action from Member States may be required to ensure that the EU remains on the path to the 2020 target. A number of European governments have introduced measures such as premiums on spot market prices, competitive tenders or capacity-dependent feed-in tariffs to help protect and increase the market penetration of renewable energy operators (EC, 2015a). In 2014, the European Commission published guidelines on state aid for environmental protection and energy for the period up until 2020 (EC, 2014), which, inter alia, should contribute towards a more harmonised approach to supporting renewable energy growth across the EU.

Country level information

Figure 2. Share of renewable energy in gross final energy consumption



Data sources: Eurostat. Share of renewable energy in gross final energy consumption

As can be seen in Figure 2, the contribution of RES to gross final energy consumption varies greatly between countries in Europe. This reflects different starting points in the deployment of renewables in each country and differences in the availability of natural resources to produce renewable energy. It also reflects, to some extent, differences in policies to stimulate renewables. Between 2004 and 2014, 12 EU countries at least doubled their renewable energy shares and Bulgaria, Croatia, the Czech Republic, Estonia, Finland, Italy, Lithuania, Romania and Sweden have already reached their targets for 2020.

The countries that are the furthest from their targets are the United Kingdom, the Netherlands and France (EEA, 2015b). As they account for about one third of the EU's final energy consumption, their progress in the deployment of renewable energy will play an important role in the prospects of the EU meeting its overall target.

Outlook beyond 2020

Additional deployment of RES beyond 2020 is vital if the EU is to achieve its aim of reducing its greenhouse gas emissions by 80 – 95 % by 2050 compared with 1990 levels — an aim that is key to the 7th EAP's long-term vision of low-carbon growth decoupled from resource use well before 2050. EU countries have already agreed on a new, EU-wide renewable energy target of at least 27 % of gross final energy consumption by 2030. The continued effort to expand renewable energy in the EU will also be a key element of the Energy Union strategy (EC, 2015b), which aims to ensure secure, sustainable and affordable energy supply for all EU citizens. Challenges for further progress in renewable energy are the expansion of the grid infrastructure to include a growing share of often decentralised RES, the increase of flexibility options in the system to accommodate a growing share of intermittent renewable technologies (e.g. through the development of demand-side management and energy storage options), and the sustainable sourcing and use of biomass (including biofuels).

About the indicator

This indicator is defined as the share of renewable energy in gross final energy consumption. Gross final energy consumption is defined as 'energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission' (EU, 2009) . The indicator includes the contribution of renewable sources to all of the final uses of energy (electricity, transport, and heating and cooling). RES include wind, solar, aerothermal, geothermal, hydro, ocean energy sources, biomass and the biodegradable fraction of waste.

Footnotes and references

EC, 2014, Guidelines on State aid for environmental protection and energy 2014–2020 (2014/C 200/01).

EC, 2015a, Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Renewable energy progress report' (COM(2015) 293 final), p. 3.

EC, 2015b, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank 'A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy' (COM(2015) 080 final).

EEA, 2015a,Trends and projections in Europe 2015 — Tracking progress towards Europe's climate and energy targets, European Environment Agency (http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2015).

EEA, 2015b, 'Share of renewable energy in gross final energy consumption (CSI 048)', European Environment Agency (http://www.eea.europa.eu/data-and-maps/indicators/renewable-gross-final-energy-consumption-3/assessment).

EEA, 2016, Renewable energy in Europe 2016 — Recent growth and knock-on effects, European Environment Agency (http://www.eea.europa.eu/publications/renewable-energy-in-europe-2016).

EU, 2009, Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (OJ L 140, 5.6.2009, p. 16-62).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D1386&from=EN).

Eurostat, 2015,Sustainable development in the European Union — Key messages, 2015 edition, p. 77, Eurostat, Luxembourg.

UNEP, 2014,Global trends in renewable energy investment 2014, Frankfurt School of Finance and Management, UNEP Collaborating Centre and Bloomberg New Energy Finance, Frankfurt, p. 15 (http://www.unep.org/pdf/Green_energy_2013-Key_findings.pdf).

AIRS briefings

1. AIRS_PO2.12, 2016, Eco-industry sector: employment and value added, European Environment Agency.
2. AIRS_PO2.13, 2016, Environmental protection expenditure, European Environment Agency.

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Energy efficiency

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Progress on energy efficiency in Europe	▲	Improve energy efficiency by 20 % (compared with a business-as-usual scenario) — Energy Efficiency Directive	●
The EU as a whole is currently on track to meet its energy efficiency target. This has been mainly due to the implementation of energy efficiency policies as well as the economic downturn. As economic growth returns, higher levels of ambition for some national targets and better implementation across the board will be required to keep Europe on track			

The Seventh Environment Action Programme (7th EAP) requires that the EU meet its energy efficiency target of reducing primary energy consumption by 20 % by 2020 (compared with a business-as-usual scenario). Energy consumption (both primary and final) has decreased over the last decade at a rate that, if continued, means that the target will be met. In fact, the EU as a whole has already met its target in final energy consumption. In 2014, final energy consumption in the EU was 1 062 Mtoe (million tonnes of oil equivalent), which was already below the EU target for 2020 (1 086 Mtoe). Together with progress in implementing energy efficiency policies, the economic downturn, structural changes in industry, lower consumption in the transport sector and a warmer climate have contributed to this development. In 2014, the sum of all 2020 targets for primary energy consumption from 28 Member States amounted to 1 526 Mtoe, which was 3 % higher than the EU target (1 483 Mtoe). As economic growth returns, more intensive efforts will be necessary to implement energy efficiency policies at the national level to ensure that the 2020 target is met.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the scene

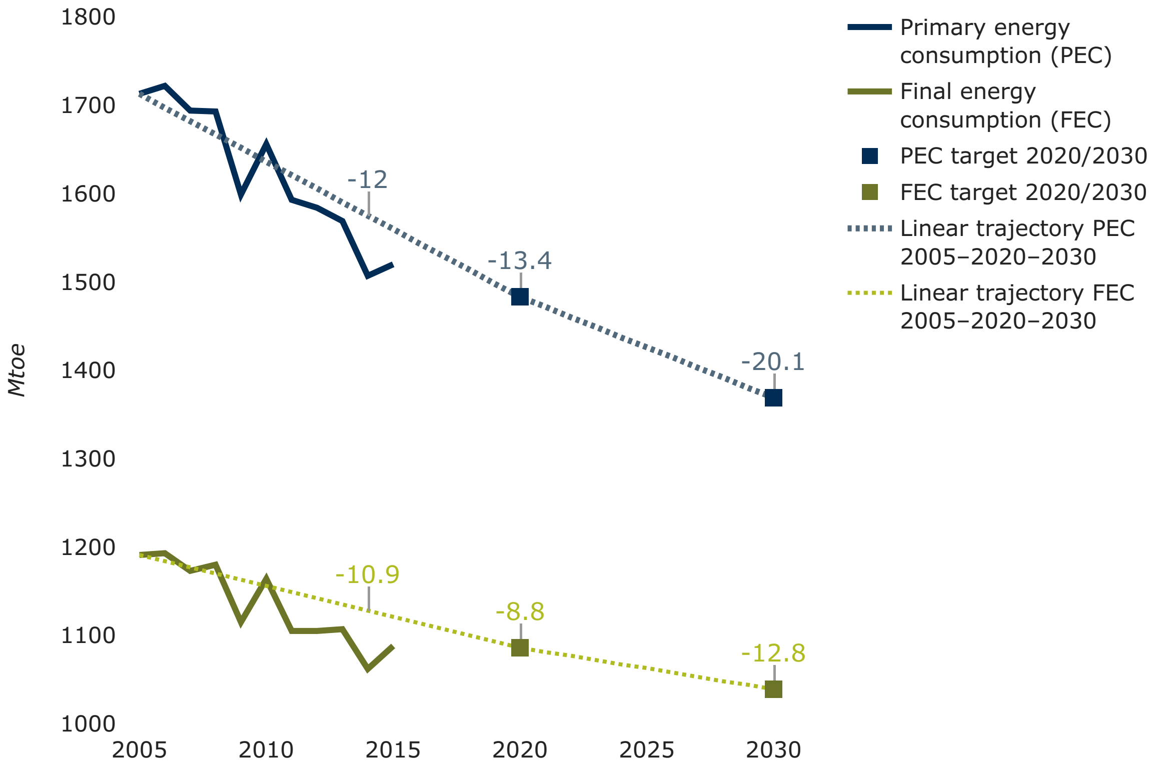
The 7th EAP requires that the EU meet its 2020 climate and energy targets (EU, 2013), which are targets for greenhouse gas emissions, energy efficiency and renewable energy. This briefing addresses the issue of energy efficiency, with greenhouse gas emissions (AIRS_PO2.5, 2015)[1] and renewables (AIRS_PO2.6)[2] being considered in two other related briefings. Meeting the energy efficiency target requires a reduction in energy consumption. This should lead to a reduction in environmental pressures associated with the production and consumption of energy. It will also contribute to a reduction in dependence on energy imports and support the achievement of renewable energy and greenhouse gas targets.

Policy targets and progress

The Energy Efficiency Directive (EED) (EU, 2012) has a target of increasing energy efficiency by 20 % by 2020 compared with a business-as-usual scenario (EC, 2011). The EED translates this into two separate 2020 reduction targets for the EU's primary and final energy consumption: a primary energy consumption of 1 483 Mtoe, representing a 13.4 % reduction compared with 2005 levels, and a final energy consumption of 1 086 Mtoe, representing an 8.8 % reduction compared with 2005 levels.

In 2014, the EU's primary energy consumption was 11.8 % lower than in 2005 (see Figure 1). According to preliminary estimates from the EEA, the EU's primary energy consumption increased slightly in 2015 (by 1 % compared with 2014), while still remaining below the indicative linear trajectory (EEA, 2016a).

Figure 1. Primary and final energy consumption in the EU and targets for 2020 and 2030



Note:
PEC and FEC targets in the year 2014, 2020 and 2030 indicate the decline in % compared to year 2005

Data sources: European Commission. Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy

In 2014, the EU has reduced its final energy consumption by 10.9 % compared with 2005, which was already below the target level set for 2020. The energy demand in 2014 was exceptionally low because of favourable climatic conditions in 2014 (warm winter), which limited the demand for energy for heating in the EU Member States.

Between 2005 and 2014, primary energy consumption in the EU-28 decreased by 12 %, particularly as a result of the reduction in final energy consumption observed during that period. The other factors contributing to this decrease included improved efficiency in the conversion of primary sources (e.g. coal and gas) into final energy and changes in the fuel mix to produce electricity and heat (higher penetration of renewable energy).

In the same period, final energy consumption in the EU-28 decreased by 10.9 % in all sectors, with the industry and household sectors registering the largest decrease of 16.5 % and 14.8 %, respectively, followed by transport (4.5 %) and services (1.7 %). This development was influenced by energy efficiency policies, structural changes in industry, the economic downturn and the warmer winter.

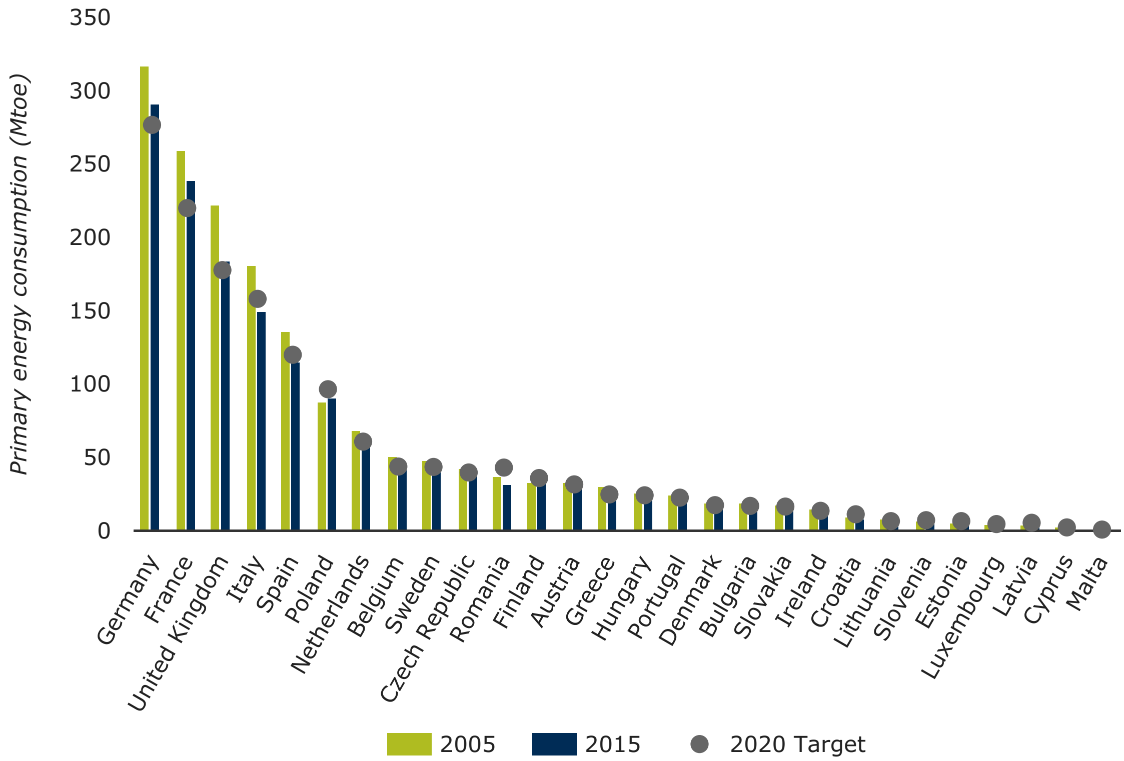
Apart from the EED, other policies and measures adopted at EU level are expected to contribute towards the 20 % reduction target. These include:

- The Energy Performance of Buildings Directive (EU, 2010a),
- Product regulations laying down minimum energy performance standards and requirements for energy labelling (the Eco-design Directive (EU, 2009) and the Labelling Directive (EU, 2010b),
- CO_2 performance standards for cars and vans,
- Increased financing through EU structural and investment funds, Horizon 2020 and dedicated facilities, such as European Local Energy Assistance (ELENA) and the European Energy Efficiency Fund,
- The EU Emissions Trading Scheme (ETS) and the Effort Sharing Decision for non-ETS sectors.

Almost half of the effort to reach the 2020 target at EU level should come from measures implemented under Article 7(1) of the EED. The use of exemptions by Member States to reduce this target, as well as the inclusion of measures that are not eligible, might limit the contribution of the commitments made under this requirement to fulfil national energy efficiency targets (Ricardo-AEA et al., 2015).

Country level information

Figure 2. Primary Energy consumption in 2005 and 2015 and estimated national target for 2020



Data sources:	a. European Commission. National energy efficiency targets 2020 b. Eurostat. Energy statistics - Supply, transformation and consumption

In 2014, 25 Member States reduced or limited their increase in primary energy consumption below the linear trajectories drawn between 2005 levels and the 2020 targets. Three Member States (Estonia, Malta and Sweden) had not achieved sufficient savings in primary energy consumption. According to preliminary data, the situation improved in 2015 for Estonia and Sweden, for which primary energy consumption levels fell below their respective linear trajectories. In contrast, in Bulgaria, France and Germany, primary energy consumption in 2015 was above their respective trajectories (EEA, 2016b).

Outlook beyond 2020

Continued improvements in energy efficiency will be needed well beyond 2020 if the 7th EAP's 2050 vision of Europe, in which 'low-carbon growth has long been decoupled from resource use', is to be achieved. In October 2014, the European Council endorsed an indicative energy efficiency target of a reduction of at least 27 % by 2030, in comparison with the EC's 2007 energy baseline scenario (EC, 2014). This target should be reviewed by 2020, having in mind a 30 % target.

About the indicator

Improving energy efficiency means using less energy for the same output or producing more with the same energy input. The 2020 target for energy efficiency has been interpreted to mean reductions in primary and final energy consumption. The indicator tracks levels of primary and final energy consumption in million tonnes of oil equivalents. Primary energy in this context covers the consumption of the energy sector itself, losses during the transformation (for example, from oil or gas into electricity) and distribution of energy, and final consumption by end users. It excludes energy carriers used for non-energy purposes (such as petroleum used for producing plastics). Final energy consumption is the total energy consumed by end users, such as households, industry, services, agriculture and fisheries. It is the energy that reaches the final consumer's door and excludes the energy used by the energy sector itself and in deliveries to the transformation sector.

Footnotes and references

(1) Article 7 of the EED is the energy efficiency obligation scheme which requires energy companies to achieve yearly energy savings of 1.5% of annual sales to final consumers, although Member States can choose alternative approaches.

EC, 2011, Commission staff working paper, Impact assessment accompanying the document 'Directive of the European Parliament and of the council on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32/EC', SEC(2011) 779 final available at https://ec.europa.eu/energy/sites/ener/files/documents/sec_2011_0779_impact_assessment.pdf, searched on 30 June 2016.

EC, 2014, Communication from the Commission to the European Parliament and the Council 'Energy efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy' (COM(2014) 520 final of 23 July 2014).

EEA, 2016a, 'Primary energy consumption by fuel (CSI 029)', European Environment Agency (http://www.eea.europa.eu/data-and-maps/indicators/primary-energy-consumption-by-fuel-6/assessment), accessed 8 December 2016.

EEA, 2016b, Trends and projections in Europe 2016 — Tracking progress towards Europe's climate and energy targets, European Environment Agency (http://www.eea.europa.eu/publications/trends-and-projections-in-europe), accessed 5 December 2016.

EU, 2009, Directive 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285/10, 31.10.2009, p.10).

EU, 2010a, Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13–35).

EU, 2010b, Directive 2010/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (OJ L 153, 18.6.2010, p. 1)

EU, 2012, Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1–56).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' Annexe A, Paragraph 43(a) (OJ L 354, 28.12.2013, p. 171–200).

Ricardo-AEA, CE Delft and Regional Centre for Energy Policy Research , 2015, Study evaluating the national policy measures and methodologies to implement Article 7 of the Energy Efficiency Directive, searched on 30 June 2016.

AIRS briefings

1. AIRS_PO2.5, 2016, Greenhouse gas emissions, European Environment Agency .
2. AIRS_PO2.6, 2016, Renewable energies, European Environment Agency .

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Household energy consumption

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Energy consumption by households	▲	Reduce the overall environmental impact of production and consumption in the housing sector - 7th EAP	●
The energy consumption of households in the EU decreased. Policies in place and the targets set for energy consumption under the Energy Union process should help to maintain this trend up to 2020 and beyond			

The Seventh Environment Action Programme (7th EAP) includes the objective that the environmental impact of housing is reduced. Energy consumption in the use phase of housing causes the largest environmental impacts. The energy consumption of households in the EU declined by 12 % between 2005 and 2014. This shows that policies on the energy performance of buildings and appliances are having an effect, but these efficiency gains have been partly offset by an increasing number of electrical appliances and larger and more homes. Climatic conditions also play an important role in energy consumption by households. Targets set for energy consumption under the Energy Union process should help to maintain the momentum towards further energy efficiency improvements and subsequent reductions in energy use by households.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

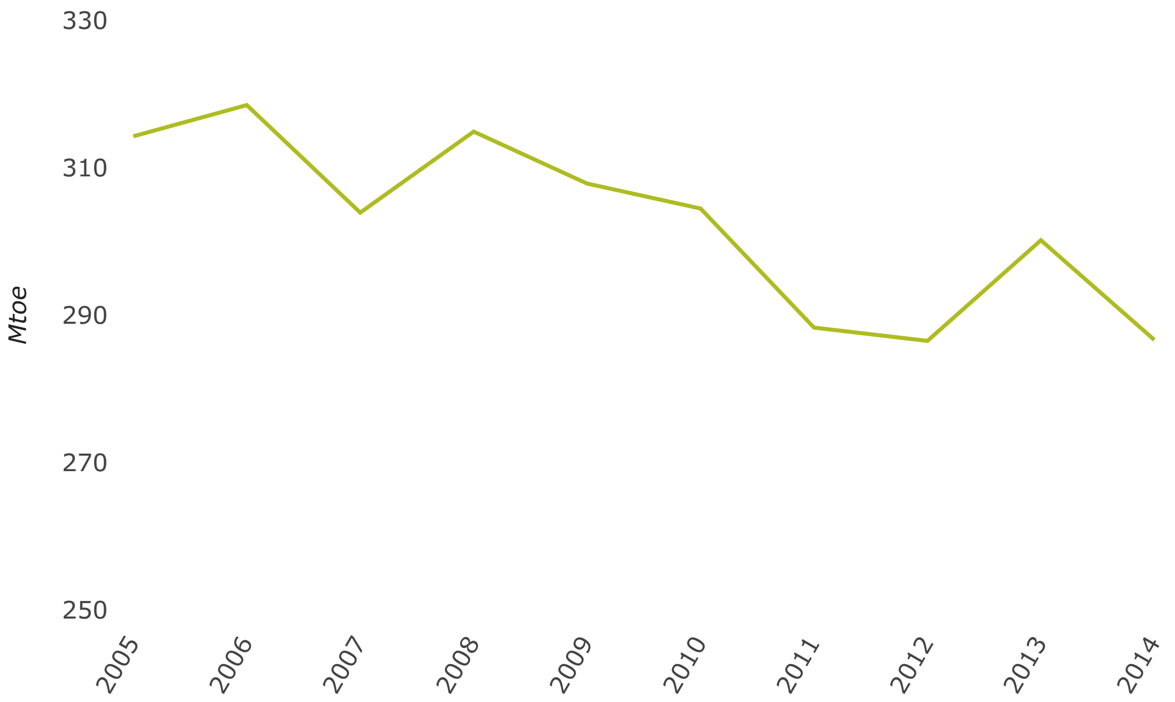
The 7th EAP calls for 'structural changes in production, technology and innovation as well as consumption patterns and lifestyles to reduce the environmental impact of production and consumption in the food, housing and mobility sectors' (EU, 2013). This briefing focuses on housing aspects, while food (AIRS_PO2.10, 2016)[1] and mobility (AIRS_PO2.9)[2] are dealt with in two other related briefings. The construction and use of housing leads to a number of environmental impacts ranging from land take and the consumption of resources to the production of waste during construction and demolition. The largest environmental impacts arguably result from energy consumption during the use phase.

Policy targets and progress

There is no environmental acquis equivalent to the 7th EAP selected objective. The key EU policies that influence household energy use are the Energy Performance of Buildings Directive (EPBD; EU, 2010a), the Energy Labelling Directive (EU, 2010b), the Ecodesign Directive (EU, 2009) and the Energy Efficiency Directive (EU, 2012). The EPBD requires Member States to set minimum energy performance standards for new buildings, to establish inspection schemes for heating and air conditioning systems or to put in place measures with equivalent effect, and to display energy performance certificates in building sale or rental advertisements. The Directive also requires all new buildings to be near zero energy by 2020 (2018 for public buildings). The Energy Efficiency Directive requires countries to set indicative targets for energy consumption, pursue renovation of at least 3 % of buildings owned and occupied by central government annually and draw up long-term plans for renovation strategies. The Energy Labelling Directive aims to encourage producers and consumers to favour more energy-efficient appliances, while the Ecodesign Directive sets minimum standards for a growing number of appliances and other energy-related products.

Figure 1 shows that the final energy consumption of households in the EU has been declining since 2005.

Figure 1. Climate corrected final energy consumption in the households sector



Data sources: a. Eurostat. Final energy consumption in households (tsdpc320)
b. Eurostat. Heating degree days (HDD-2014)

Energy efficiency policies have led to reductions in energy consumption, while lifestyle changes have had the opposite effect. Energy efficiency improvements in space heating and the use of more efficient electrical appliances, as well as behavioural changes driven by higher energy prices and the 2008 economic downturn all contributed to reductions in overall energy consumption. An increase in the number of appliances, in the average size of dwellings, in the number of dwellings and in the level of comfort partially offset efficiency improvements.

Approximately two thirds of energy used by households in Europe is for space heating. Energy efficiency improvements for space heating occurred as a result of the improved energy performance of the building envelope and increased efficiency of the heating equipment. In 2013, a number of EU regulations on labelling and ecodesign for space heating equipment were introduced, and they are expected to result in further reductions in energy consumption in the residential sector and, consequently, a reduction in the associated environmental impacts (JRC, 2016).

Improvements in the energy efficiency of large appliances is driven by EU directives on mandatory energy labelling and ecodesign. The proportion of the most efficient appliances (A+, A++ or, more recently, A+++) has increased significantly: from 10 % in 2005 to 96 % in 2014 for refrigerators, and from 16.5 % to 90 % for washing machines (EEA, 2016).

On 25 February 2015, the Commission adopted ‘A framework strategy for a resilient energy union with a forward-looking climate change policy’ (EC, 2015). The framework creates the momentum to bring about a transition to a low-carbon, secure and competitive energy system along five closely related and mutually reinforcing dimensions: security of supply, a fully integrated energy market, energy efficiency, climate change, and research and innovation.

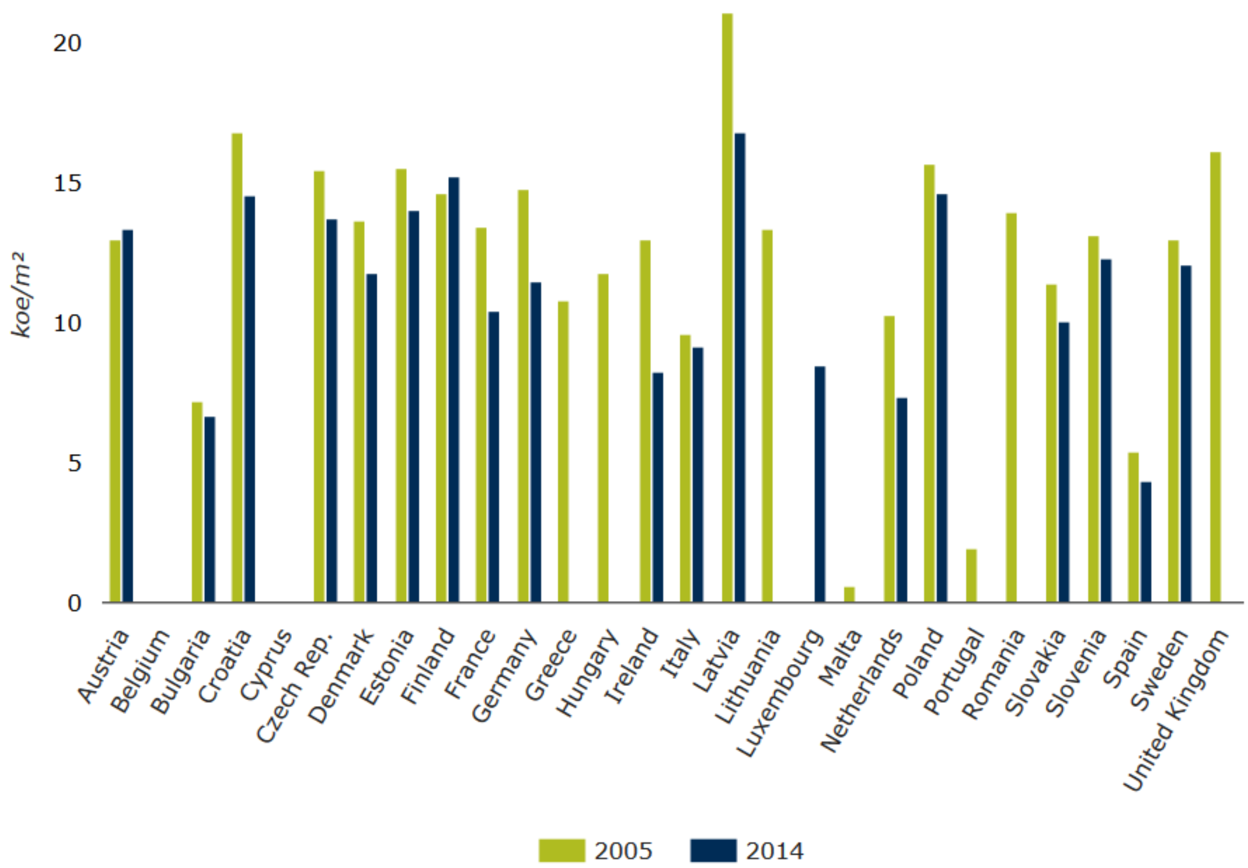
Looking to the future, the energy efficiency targets set under the revised Energy Efficiency Directive and Energy Union process should help to keep the momentum towards increasing energy efficiency and lead to further reductions in the energy consumption of households.

Country Level Information

Figure 2 shows the annual average energy household consumption per square metre for EU countries in 2005 compared with 2014. The data have been corrected for annual variations in weather across all countries.

Energy use, measured in kilograms of oil equivalent (koe) per square metre, differs widely between countries because of the state and age of the building stock, the size of the dwelling, the heating/cooling systems used and energy efficiency measures. In 2014, energy consumption for space heating ranged from less than 10 koe/m^2 in countries such as Spain, Bulgaria and Italy to more than 14 koe/m^2 in countries such as Croatia, Estonia, Latvia, Finland and Poland.

Figure 2. Climate corrected average energy consumption per dwelling in 2005 and 2014 in selected EU countries



Data sources:ODYSSEE - Energy Efficiency Indicators in Europe. Energy consumption per dwelling

Outlook beyond 2020

Energy use in households accounts for about one quarter of all the energy used in the EU. Therefore reductions in household energy consumption are necessary if Europe is to achieve the low-carbon growth envisaged in the long-term vision of the 7th EAP.

Reducing energy consumption in existing buildings presents a major challenge to achieving this goal as the turnover of the building stock is slow and behavioural changes take time to implement on a large scale. Progress can be achieved by making better use of climate finance and revenues from energy taxation, for example to support large-scale renovation and local authorities, and by encouraging changes in consumers' behaviour through the creation of framework conditions that can better enable the consumer to participate in the energy market (OpenExp, 2016).

The recently launched Heating and Cooling Strategy (EC, 2016) should help reduce the energy consumption of households by promoting increased use of district heating and better integration of renewable energy sources.

About the indicator

Figure 1 represents final energy consumption by households. This is the total energy consumed each year by the household sector. It excludes energy lost in the production and transport of the energy to households, as well as the energy consumption of household members for transport. The data are corrected to account for annual variations in weather using heating degree-days for space heating. Figure 2 represents the energy consumption of households for space heating per square metre. The indicator is calculated as the ratio between final energy consumption of households for space heating corrected for annual variations in weather using heating degree-days across countries and the average size of dwellings in each Member State multiplied by the number of dwellings (ODYSSEE, 2016).

Footnotes and references

EC, 2015, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank 'A framework strategy for a resilient Energy Union with a forward-looking climate change policy' (COM(2015) 080 final)

EC, 2016, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'An EU strategy on heating and cooling' (COM(2016) 51 final)
(https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v14.pdf)

searched on 17 October 2016.

EEA, 2016, 'Progress on energy efficiency in Europe (ENER 037)', European Environment Agency (forthcoming).

EU, 2009, Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 172–197).

EU, 2010a, Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast) (OJ L 153, 18.6.2010, p. 124–146).

EU, 2010b, Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (OJ L 153, 18.6.2010, p. 1–12).

EU, 2012, Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1–56).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annex A, paragraph 43 (OJ L 354, 28.12.2013, p. 171–200).

JRC, 2016, Energy consumption and energy efficiency trends in the EU-28 2000–2014(http://iet.jrc.ec.europa.eu/energyefficiency/node/9145 searched on 17 October 2016.

ODYSSEE, 2016, 'Key indicators' database, http://www.indicators.odyssee-mure.eu/ searched on 8 November 2016.

OpenExp, 2016, 'Energy transition of the EU building stock: Unleashing the 4th Industrial Revolution in Europe' (http://openexp.eu/publications/energy-transition-eu-building-stock-unleashing-4th-industrial-revolution-europe) searched on 17 October 2016

AIRS briefings

1. AIRS_PO2.10, 2016, Food consumption — animal based products, European Environment Agency.
2. AIRS_PO2.9, 2016, Transport greenhouse gas emissions, European Environment Agency .

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Transport greenhouse gas emissions

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Greenhouse gas emissions from transport	▲	Reduce the overall environmental impact of production and consumption in the mobility sector - 7th EAP	●
Past transport greenhouse gas emissions increased from 1990 to 2014 despite a decline between 2008 and 2013. It is uncertain if emissions will reduce by 2020, since according to projections by the EU Member States emissions will remain more or less stable between 2015 and 2020			

The Seventh Environment Action Programme (7th EAP) includes the objective of reducing the environmental impact of mobility (i.e. transport). Transport is the cause of significant environmental pressures including greenhouse gas emissions, biodiversity fragmentation, air pollutant emissions and noise. Greenhouse gas emissions from the transport sector have been used here as a proxy indicator for the overall environmental impacts of the transport sector. Greenhouse gas emissions have increased since 1990 in line with trends in economic growth and transport demand. Improvements in vehicle efficiency have nevertheless helped to limit the overall increase. It is uncertain if emissions will reduce by 2020, since according to projections by the EU Member States, emissions will remain more or less stable between 2015 and 2020.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the scene

The 7th EAP calls for a reduction in the environmental impact of mobility (EU, 2013). Transport (i.e. mobility) is a major contributor to climate change, air pollution, noise, natural resource depletion and land fragmentation. Reducing the environmental impact of transport is usually done by reducing the demand for travel, introducing new, cleaner technologies and shifting towards less environmentally damaging transport modes. Greenhouse gas emissions from the transport sector have been used in this briefing as a proxy indicator for the overall environmental impacts of the transport sector. These emissions reflect the level and efficiency of the sector's activity as well as the mix of transport modes. In addition, climate change (and therefore greenhouse gas emissions) is one of the most significant environmental issues, and transport contributes about one quarter of the EU's total greenhouse gas emissions.

Policy targets and progress

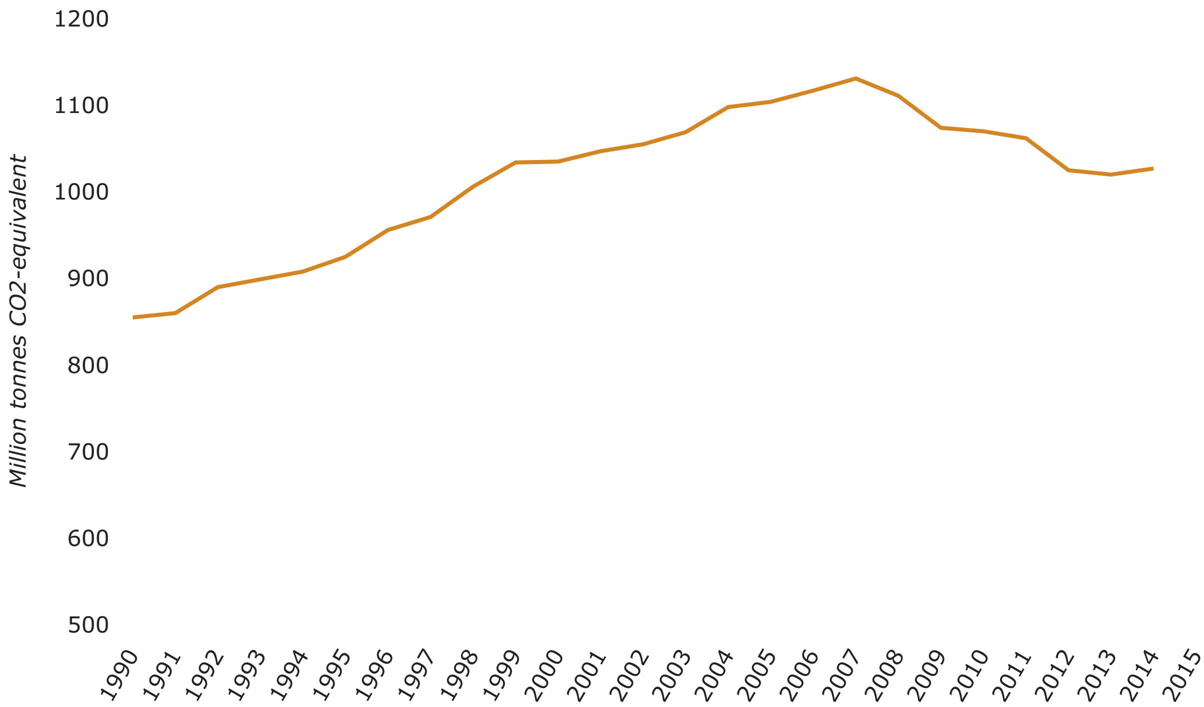
In 2011, the European Commission published a White Paper on transport entitled Roadmap to a Single European Transport Area — Towards a competitive and resource efficient transport system (EC, 2011). It acts as a framework to guide future policy developments in the transport sector over the next decade. The White Paper sets out 10 goals for a competitive and resource-efficient transport system, serving as benchmarks for achieving the target of a 60 % reduction in greenhouse gas emissions from the EU transport sector by 2050 (from 1990 levels).

From 1990 to 2014, greenhouse gas emissions from transport increased by 20.1 % compared with 1990 levels (see Figure 1). This increase comes despite improvements in the efficiency of transport and is in line with increases in the level of economic activity as measured by gross domestic product (GDP) as well as increases in demand for transport (both freight and passenger) (EEA, 2016a, 2016b).

Nevertheless, emissions decreased from 2008 to 2013, in part because of the lower levels of economic activity — manifesting also in lower levels of freight transport (EEA, 2016b) — following the 2008 economic downturn, as well as further implementation of transport efficiency measures.

Road transport accounts for 72 % of the total greenhouse gas emissions of the sector (EEA, 2016c). Energy efficiency improvements in road transport played a key role in limiting the increase of road transport emissions. Such improvements were brought about in part by means of increasingly stringent technical standards, including the average CO_2 emission standards for new passenger cars (EU, 2009) and vans (EU, 2011). The increased use of less carbon-intensive fuels, such as liquefied petroleum gas (LPG) and biofuel blends, has also led to lower road transport emissions (EEA, 2015).

Figure 1. Greenhouse gas emissions from transport, EU



Note:
Greenhouse gas emissions show total emissions from transport including from international aviation and excluding from international shipping.

Data sources:

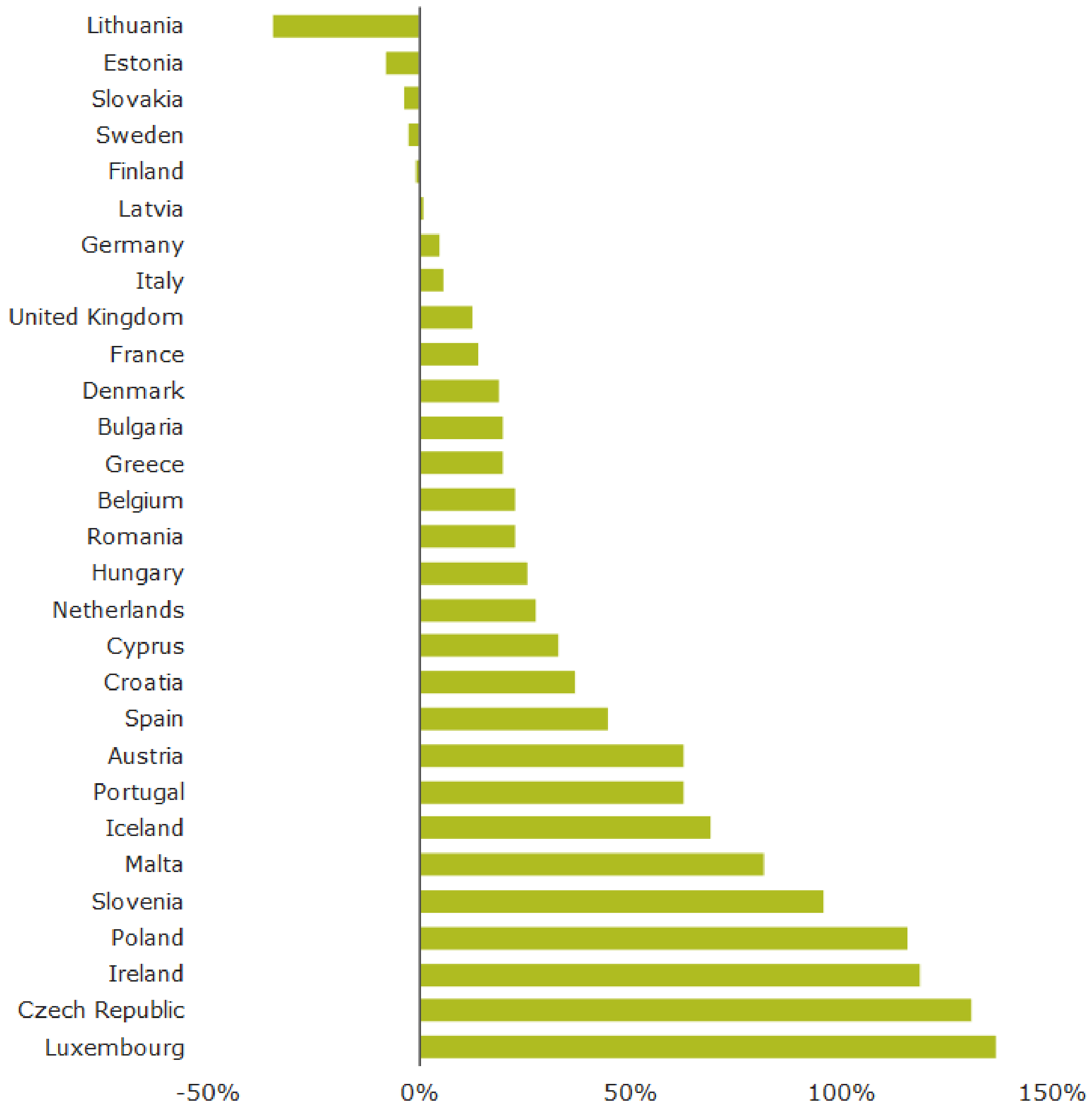
a. EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

b. EEA – Indicator TERM002

It is uncertain if transport greenhouse gas emissions will reduce by 2020, since according to projections by the EU Member States, emissions for the EU (including international aviation but excluding international shipping) will remain more or less stable between 2015 and 2020 in both scenarios: with existing measures and with additional measures (EEA, 2016d, 2016e). Preliminary estimates for 2015 emissions show, nevertheless, an increase of 2.3 % above 2014 levels (EEA, 2016f).

Country level information

Figure 2. Change in greenhouse gas emissions from transport, 1990 to 2014, by country



Note:
Greenhouse gas emissions show total emissions from transport including from international aviation and excluding from international shipping.

Data sources: EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

Outlook beyond 2020

The 10 goals set by the European Commission White Paper on Transport (EC, 2011) are expected to lead to the future introduction of new EU policies to increase the efficiency of Europe's transport sector. The main target of the White Paper is to reduce greenhouse gas emissions to 40 % of 1990 levels by 2050. A key assumption in the White Paper is that technologies that contribute to lower greenhouse gas emissions will be increasingly available, especially after 2030, such as the electrification of transport and more intensive use of advanced biofuels.

A modal shift away from road transport is also a key element of the EU's decarbonisation ambitions. The White Paper explicitly states the ambition to shift 30 % of road transport for distances over 300 km to rail and inland navigation by 2030, and more than 50 % by 2050.

Nevertheless, total transport demand is predicted to continue growing during the 2020–2030 period in line with the 2010–2020 patterns (1 % a year for passenger transport (passenger km) and 1.5 % for freight transport (tonne km)) and at lower rates between 2030 and 2050 (0.7 % a year for passenger transport and 0.8 % for freight transport) (EC, 2016).

Integrated measures addressing both production and consumption would therefore be needed in the long run in order to, inter alia, contain the expected increase in transport demand and reduce the greenhouse gas emissions from transport by 60 % by 2050.

About the indicator

This indicator presents the total EU greenhouse gas emissions from transport including emissions from international aviation but excluding emissions from international maritime transport. Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide. The individual gases were converted into greenhouse gas emissions by being weighted according to their global warming potentials following the relevant guidelines of the Intergovernmental Panel on Climate Change. For further information on the indicator and on the method used, please see the indicator specification of the EEA indicator TERM (Transport and Environment Reporting Mechanism) 002 (EEA, 2016g).

The indicator does not include greenhouse gas emissions from the construction of transport-related infrastructure or from the production of transport vehicles within and outside the EU.

Footnotes and references

EC, 2011, White Paper 'Roadmap to a Single European Transport Area — Towards a competitive and resource efficient transport system' (COM(2011) 144 final) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:en:PDF) accessed 28 October 2016.

EC, 2016, EU Reference Scenario 2016: Energy, transport and GHG emissions, Trends to 2050, European Commission (https://ec.europa.eu/energy/sites/ener/files/documents/ref2016_report_final-web.pdf) accessed 28 October 2016.

EEA, 2015, Evaluating 15 years of transport and environmental policy integration — TERM 2015: Transport indicators tracking progress towards environmental targets in Europe, EEA Report No 7/2015 (http://www.eea.europa.eu/publications/term-report-2015) accessed 28 October 2016.

EEA, 2016a, 'Passenger transport demand (CSI 035/TERM 012)', European Environment Agency (http://www.eea.europa.eu/data-and-maps/indicators/passenger-transport-demand-version-2/assessment-4).

EEA, 2016b, 'Freight transport demand (CSI 036/TERM 013)', European Environment Agency (http://www.eea.europa.eu/data-and-maps/indicators/freight-transport-demand-version-2/assessment-4).

EEA, 2016c, National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism provided by the European Environment Agency, EEA greenhouse gas — data viewer, European Environment Agency (http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer) accessed 28 October 2016.

EEA, 2016d, Trends and projections in Europe 2016 — Tracking progress towards Europe's climate and energy targets, EEA Report No 29/2016, European Environment Agency

EEA, 2016e, 'Deliveries for projections', Eionet reporting obligations database (ROD) (http://rod.eionet.europa.eu/obligations/697/deliveries) accessed 28 October 2016.

EEA, 2016f, Approximated EU greenhouse gas inventory: Proxy GHG emission estimates for 2015, EEA Report No 23/2016, European Environment Agency.

EEA, 2016g, 'Greenhouse gas emissions from transport (TERM 002)' (http://www.eea.europa.eu/data-and-maps/indicators/freight-transport-demand-version-2/assessment-4).

EU, 2009, Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23

April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles (http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32009R0443) accessed 26 October 2016.

EU, 2011, Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO_2 emissions from light-duty vehicles (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:145:0001:0018:en:PDF) accessed 26 October 2016.

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (OJ L 354, 28.12.2013, p. 171–200) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2013:354:FULL&from=EL) accessed 20 October 2016.

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Food consumption – animal based products

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Consumption of meat, dairy, fish and seafood	▲	Reduce the overall impact of production and consumption in the food sector - 7th EAP	●

Reducing the consumption of animal products and shifting to other sources of protein has the potential to reduce environmental impacts related to food. Consumption of meat, dairy, and fish and seafood products increased gradually between 1995 and 2008, but has stabilised since then. Levels of saturated fat and red meat consumption remain above dietary guidelines and result in high GHG and nitrogen emissions

The Seventh Environment Action Programme (7th EAP) aims to reduce the overall impacts of production and consumption in the food sector. Animal products have been found to cause high environmental impacts, primarily related to their production. For example, meat and dairy products contribute on average 24 % of the environmental impacts from total final consumption in the EU-27 (Weidema et al., 2008). Therefore, reducing the consumption of animal products and shifting to other sources of protein has the potential to reduce environmental impacts related to food production and consumption.

Consumption of meat, dairy, and fish and seafood products increased gradually between 1995 and 2008 but has stabilised since then. The composition of meat consumption has also changed, with less beef and more poultry being consumed. However, levels of saturated fat and red meat consumption remain high, resulting in health and environmental impacts. The increase in seafood consumption has positive health implications but, depending on the fish species being consumed, can challenge other 7th EAP objectives regarding healthy marine ecosystems.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

The 7th EAP calls for changes in consumption patterns and lifestyles to reduce the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors (EU, 2013). Meat and dairy products contribute around 6 % of the economic value but 25 % of the environmental impacts caused by total final consumption in the EU (Weidema et al., 2008). The food sector contributes strongly to climate change, eutrophication, land take and a host of other environmental problems (Bailey et al., 2014). This briefing presents trends in the consumption of animal-based food products (meat, dairy, fish and seafood), as a reduction in the demand for these products and a shift to other sources of protein has the potential to reduce the EU's environmental footprint while also delivering health benefits (EuroHealthNet, 2013). For the housing and mobility sectors, please see the Household energy consumption briefing (AIRS_PO2.8, 2016)[1] and the Transport greenhouse gas emissions briefing (AIRS_PO2.9, 2016).[2]

Policy targets and progress

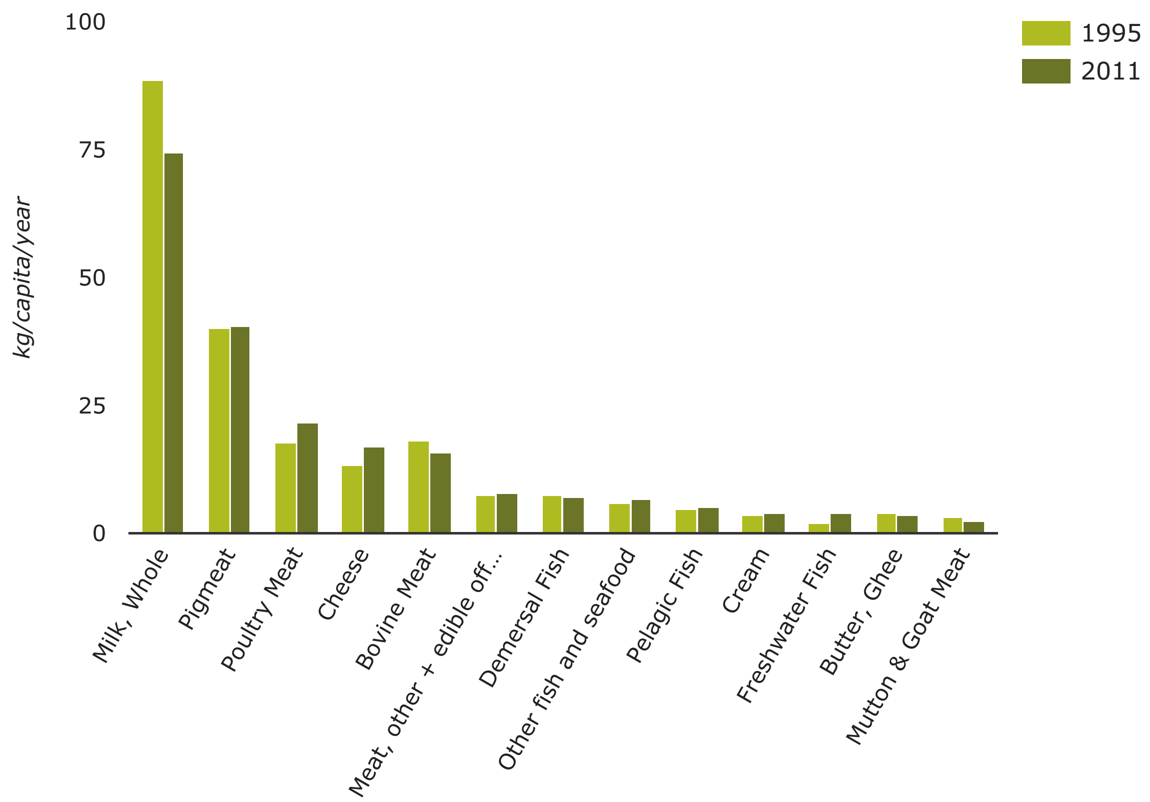
The food system is a major driver of environmental change, with implications for energy and water security. Although the EU has no explicit food policy, the food system cuts across a wide range of policy areas including agriculture, fisheries, biodiversity and health. The 7th EAP and the Roadmap to a Resource Efficient Europe (EC, 2011) share the objectives of reducing the impact of food production and consumption and reducing resource inputs by tackling food waste in particular.

Different food products have very different environmental footprints. Diets characterised by a high intake of animal products result in consumption of saturated fat and red meat in quantities that exceed dietary recommendations. Their production requires large areas of land and results in high greenhouse gas and nitrogen emissions. Therefore, a healthier diet can result in lower environmental impacts.

Intensively farmed beef has a carbon footprint seven times that of poultry. Land use and eutrophication loading are six times and four times higher, respectively, per kilogram. The environmental footprint of pork lies somewhere between the two for most impact categories (Weidema et al., 2008). Animal welfare issues related to intensive methods of poultry rearing are also a consideration when evaluating impact. In addition, while grazing animals can contribute positively to the biodiversity of agricultural land, overgrazing contributes to the lack of improvement in the conservation status of habitats associated with agricultural ecosystems; see EU protected habitats briefing (AIRS_PO1.8, 2016).[3]

Absolute and indexed meat, dairy and seafood consumption are shown in Figures 1 and 2. Average per capita consumption of meat (all types), dairy, and fish and seafood products generally increased in the EU-28 up until 2008 but have stabilised since then.

Figure 1. Average per capita consumption of meat, fish, seafood and dairy products, EU



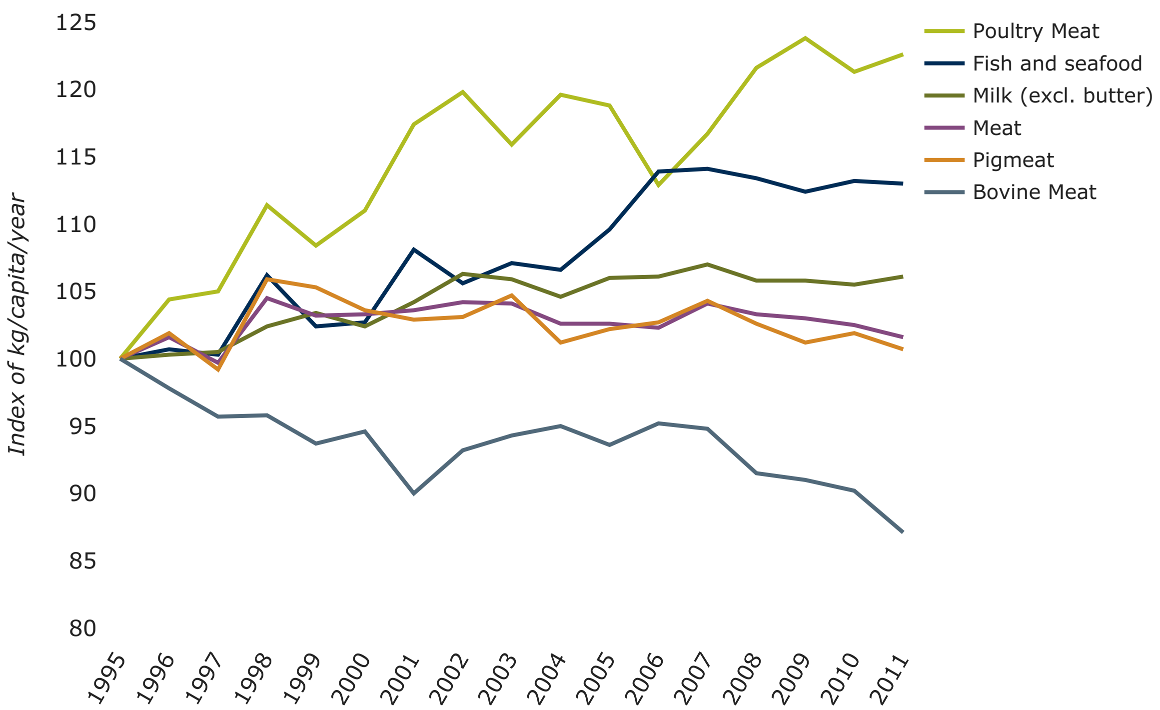
Data sources:	a. FAO. Food Supply - Livestock and Fish Primary Equivalent	b. EEA – Indicator SCP020

Bovine meat consumption has reduced steadily over the monitoring period while poultry consumption has risen. The average citizen in the EU-28 ate 2.3 kg less beef in 2011 than in 1995 (a 13 % decrease), but 4.0 kg more poultry (a 23 % increase), with pork consumption remaining relatively stable (Figure 1). This shift will have led to a reduction in environmental impacts but this may have been somewhat offset by a 3.8 kg per capita increase in cheese consumption. The shift from beef to poultry is also in line with health guidelines in guarding against cardiovascular disease (EuroHealthNet, 2013).

There is no explicit policy objective of reducing meat and dairy consumption for environmental reasons (Bailey et al., 2014). It may well be that European dietary changes have been brought about by increasing awareness of healthier diets, although price changes may also have had an effect. Beef prices, for example, reached record highs in 2013 (EC, 2014). Subsequently, the European Commission noted a rebound in meat and beef consumption in 2014 and projected a further 2 % increase in 2015 continuing into 2016 (EC, 2015a).

Looking towards 2020, the 2013 Common Agricultural Policy (CAP) reform is more neutral with respect to particular agricultural products than earlier CAPs. However, the recently adopted EUR 500 million aid package for farmers is aimed specifically at supporting cattle and pig farmers (EC, 2015b). A positive development is the increasing focus at both EU and Member State levels on reducing food waste, through actions in the Circular Economy Package (EC, 2015c) and Member States' waste prevention strategies.

Figure 2. Developments in per capita consumption of meat, fish and dairy products, EU (indexed)



Data sources: a. FAO. Food Supply - Livestock and Fish Primary Equivalent
b. FAO. Food Supply - Crops Primary Equivalent c. FAO. Annual Population
d. EEA – Indicator SCP020

Europeans ate on average about 2.7 kg more fish and seafood each in 2011 than in 1995. About 1.8 kg of this increase was consumption of freshwater fish, a 95 % increase. The remaining 0.9 kg of increased fish and seafood consumption comprised crustaceans (e.g. prawns, mussels), cephalopods (e.g. squid) and pelagic (bottom-dwelling) fish.

Imports of the majority of fish and crustacean products, mostly processed fish, to the EU increased by 44 % between 2000 and 2010, to nearly 5 million tonnes. Aquaculture in Europe accounts for about 20 % of fish production. As aquaculture production in the EU-28 has been steady since 1995, increasing consumption has been met by imports (EEA, 2014).

The increase in the consumption of seafood during this period is also in line with healthy eating advice. However, again it is difficult to assess the environmental implications of this trend. About one third of fish stocks in the North-East Atlantic and half of the assessed commercial fish stocks in the Mediterranean Sea are being fished beyond safe biological limits; for further information on the status of commercial fish stocks please see the Marine fish stocks briefing (AIRS_PO1.5).[4] According to the 7th EAP, the Marine Strategy Framework Directive (EU, 2008) target to achieve 'good environmental status' by 2020 is coming under severe pressure, due in part to continued overfishing. The 7th EAP includes a target to urgently increase efforts to ensure that healthy fish stocks are achieved. This may be compromised by the increasing consumption of fish, depending on the species consumed.

Country level information

At the country level, the proportions of various food groups in consumption, and trends in these, vary greatly. Absolute levels of meat consumption per capita across the EU-28 also differ, ranging from 53 kg/year in Bulgaria to 106 kg/year in Austria in 2011. The differences between countries have reduced, however, since 1995.

Outlook beyond 2020

As a major greenhouse gas emitter, the food sector may need to undergo significant changes if the EU is to meet its 2050 target for an 80 – 95 % reduction in greenhouse gases. Current policies aimed at reducing the impact of food are mostly focused on the production side, e.g. reducing inputs and better manure and slurry management. On the consumption side, the policy focus is largely limited to labelling schemes and reducing food waste. Given the health relevance and implications of meat, dairy, fish and seafood consumption for the population, potential environmental and health co-benefits, as well as conflicts and trade-offs, should be explored when considering options to reduce environmental pressures related to food consumption. However, it seems doubtful that the necessary gains needed by 2050 in reducing greenhouse gas emissions can be achieved without tackling meat and dairy consumption (Weidema et al., 2008; Bailey et al., 2014).

About the indicator

The indicator shows consumption of selected meat, dairy, fish and seafood products in the EU-28, between 1995 and 2011. The data were extracted from the Food and Agriculture Organization of the United Nations (FAO) statistics database. This indicator is defined as the supply of these products to the final consumer. The indicator is presented both in absolute quantities per capita per year (Figure 1) and in indexed form (Figure 2). The amount of food actually consumed may be lower than the quantity shown in the indicator because of wasted edible food by households and other final consumers.

Footnotes and references

Bailey, R., Froggatt, A. and Wellesley, L., 2014, Livestock – Climate change's forgotten sector: Global public opinion on meat and dairy consumption, Chatham House Research Paper. (https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20141203LivestockClimateChangeBaileyFroggattWellesley.pdf), last accessed 11/11/2016.

EC, 2011, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Roadmap to a Resource Efficient Europe' (COM(2011) 571 final of 20 September 2011).

EC, 2014, Short term outlook for arable crops, meat and dairy markets in the European Union, Winter(http://ec.europa.eu/agriculture/markets-and-prices/short-term-outlook/index_en.htm), last accessed 11/11/2016.

EC, 2015a, Short term outlook for arable crops, meat and dairy markets in the European Union, Autumn(http://ec.europa.eu/agriculture/markets-and-prices/short-term-outlook/index_en.htm), last accessed 11/11/2016.

EC, 2015b, 'Aid package for farmers published' (http://ec.europa.eu/agriculture/newsroom/231_en.htm).

EEA, 2014,Environmental Indicator Report 2014: Environmental impacts of production-consumption systems in Europe, European Environment Agency.

EU, 2008. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (OJ L 164, 25.6.2008, p. 19).

EuroHealthNet, 2013, 'Massive new study shows EU should act on red meat to save lives and costs' (http://eurohealthnet.eu/media/massive-new-study-shows-eu-should-act-red-meat-save-lives-and-costs), last accessed 11/11/2016.

Weidema, B.P., Wesnæs, M., Hermansen, J., Kristensen, T., and Halberg, N., 2008,Environmental improvement potentials of meat and dairy products, Report for the European Commission Joint Research Centre (http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1721).

AIRS briefings

1. AIRS_PO2.8, 2016, Household energy consumption, European Environment Agency
2. AIRS_PO2.9, 2016, Transport greenhouse gas emissions, European Environment Agency
3. AIRS_PO1.8, 2016, EU protected habitats, European Environment Agency
4. AIRS_PO1.5, 2016, Marine fish stocks, European Environment Agency

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Environmental and labour taxation

Indicator	EU indicator past trend		Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Share of environmental and labour taxes in total tax revenues	Environmental taxes ▲	Labour taxes ▲	Shift taxation from labour towards the environment - 7th EAP	●
For the EU as a whole, there has been no positive progress over the examined period and there are no indications of any change in the coming years				

The Seventh Environment Action Programme (7th EAP) calls for a shift in taxes from labour towards pollution and resource use as a means of helping to achieve environmental objectives and stimulating employment and green growth. Taxes on labour remain eight times higher than environmental taxes in the EU. These relative shares in overall taxes have changed very little over the last decade and only five EU countries have decreased their shares of labour taxes while increasing their shares of environmental taxes. The main reasons for this lack of progress appear to be a combination of the political difficulty of making any changes to a country's tax system, along with the real and perceived economic and social challenges regarding environmental taxes. Research and analysis suggest that, in order for it to be successful, this type of fiscal reform requires careful planning to avoid any negative economic and social impacts and widespread consultation that reflects good governance principles. There are no current indications from Member States that they intend to shift taxes from labour towards the environment, so the outlook for 2020 appears negative.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

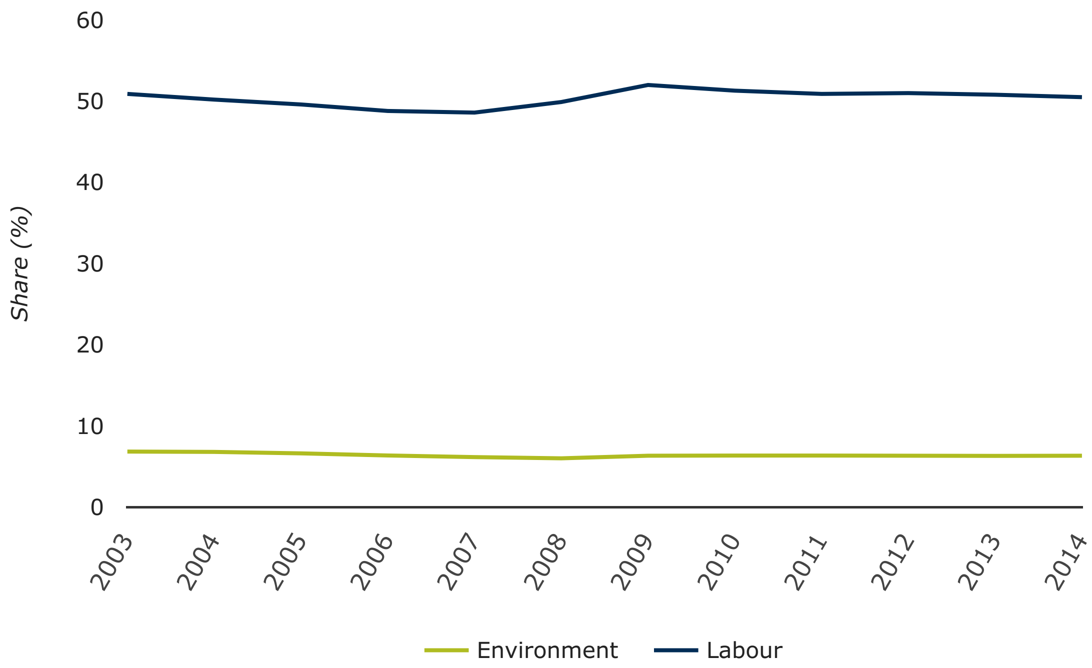
Setting the Scene

The 7th EAP calls on the EU and Member States to consider 'fiscal measures in support of sustainable resource use such as shifting taxation away from labour towards pollution' (EU, 2013). This briefing presents trends in the shares of environmental and labour taxes in total tax revenues. The reasoning that it is more environmentally and economically sound to tax pollution and resource use than to tax labour is based on the theory that increased taxes on resources should incentivise a reduction in their use. Environmental taxation can allow fiscal consolidation while, at the same time, encouraging restructuring towards a resource-efficient economy (EC, 2011). Environmental tax reforms can change behaviour, redirecting consumption towards less taxed and less polluting commodities. Reducing taxation on labour and investment (for example income tax and corporation tax) can also encourage economic growth and, through targeted investment, can specifically encourage the creation of green jobs, for example in the recycling and energy efficiency sectors (EEA, 2013).

Policy targets and progress

The Roadmap for a Resource Efficient Europe (EC, 2011) includes a milestone that, by 2020, a major shift of taxation from labour towards the environment will lead to a substantial increase in the share of environmental taxes that contribute to public revenues, in line with the best practice of Member States.

Figure 1. Shares of environment and labour taxes in total tax revenues from taxes and social contributions, EU



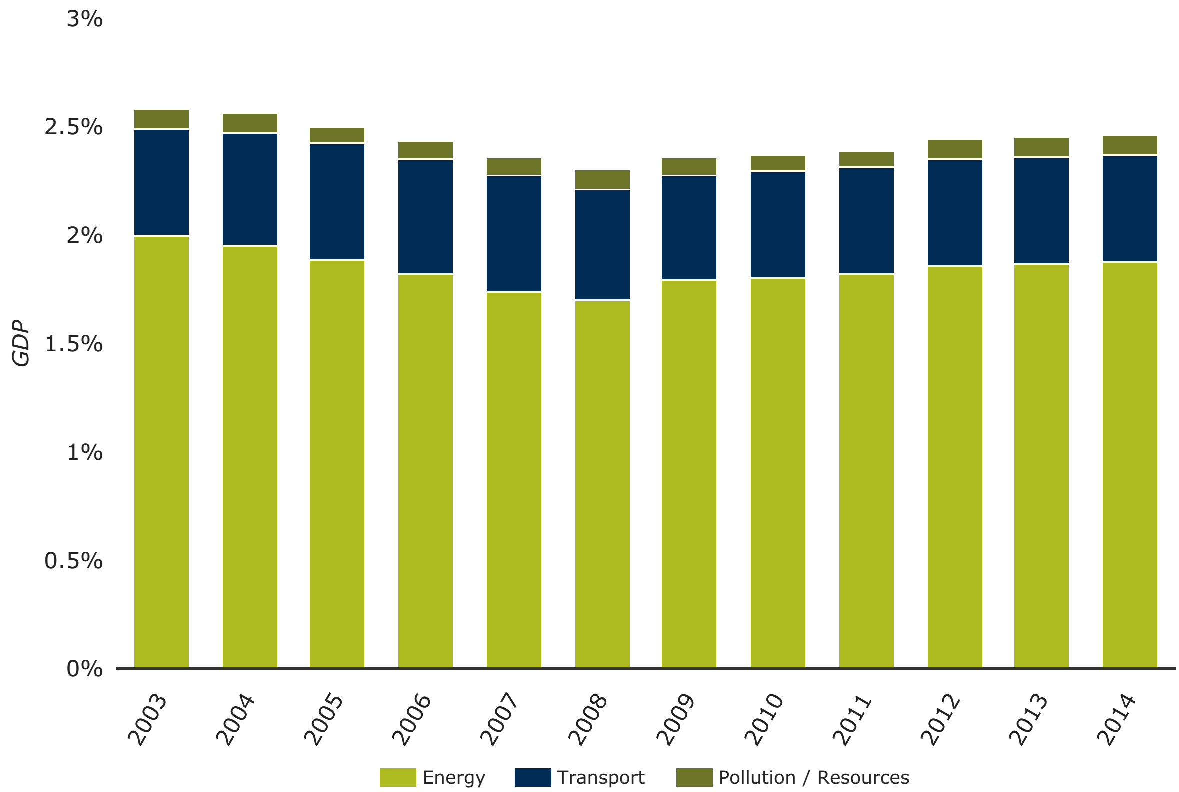
Data sources:	a. European Commission. Data on taxation b. Eurostat. Shares of environmental and labour taxes (tsdgo410)

For the EU as a whole, there has been no positive progress over the last decade (Figure 1). At the beginning of the 2000s, there was a slight increase in environmental taxes relative to labour taxes, but, since the economic downturn, this has not been sustained. The share of total revenues from taxes on labour has consistently remained at approximately eight times that of revenues from environmental taxes.

The years following the economic downturn offered the opportunity to use environmental fiscal reform to address rising unemployment. The lack of any positive movement at the EU level indicates that this opportunity has not been capitalised upon. This lack of progress comes in spite of renewed interest in environmental fiscal reform driven by various factors, including the push for fiscal consolidation and the growing recognition of the financial burden of certain measures, such as fossil fuel subsidies. The recent sharp fall in global oil prices is seen by some as providing an opportunity to launch carbon-pricing mechanisms and to reform fossil fuel subsidies (IEEP, 2015).

In addition to taxing energy and carbon, resource taxes offer opportunities to improve material resource efficiency (see the Resource efficiency briefing (AIRS_PO2.1, 2016)[1]). Such taxes are still largely unused in the EU, comprising only 3.6 % of revenues from all environmental taxes in 2014, which corresponds to 0.09 % of gross domestic product (GDP) in the EU (Figure 2). There is no sign of an increase in the share of resource taxes in environmental taxes over recent years, despite an increasing focus on material resources in EU policy, represented, for example, by the 2011 Roadmap to a Resource Efficient Europe (EC, 2011) and the 2015 Circular Economy Package (EC, 2015a).

Figure 2. Environment taxes by type as share of GDP, EU



Data sources: Eurostat. Environmental tax revenues (env_ac_tax)

This lack of progress may be a result of a number of obstacles that have been identified in relation to environmental fiscal reform. In its 2015 review of tax reforms in Member States (EC, 2015b), the European Commission refers to three key barriers in relation to the implementation of environmental taxation: (1) the potentially regressive nature of environmental taxes and possible associated equity issues; (2) the potentially harmful effect on the competitiveness of the sectors concerned; and (3) the administrative and enforcement costs of raising these taxes. The Commission, nevertheless, offers successful implementation strategies, namely transparency and early engagement with those affected by the tax, gradual implementation of the tax according to a pre-announced schedule and making such tax measures part of a broader policy package designed to achieve the specific environmental objective.

Analysis by the European Commission also suggests that higher energy taxes, compensated for by a reduction in labour taxation, can, in fact, improve competitiveness (Barrios et al., 2014). However, the administrative and enforcement costs must be in proportion to the political and environmental objectives that the tax aims to achieve. Other studies also suggest that any potentially negative impacts of environmental taxes can be reduced or addressed through careful design and implementation of tax adjustments (IEEP, 2015).

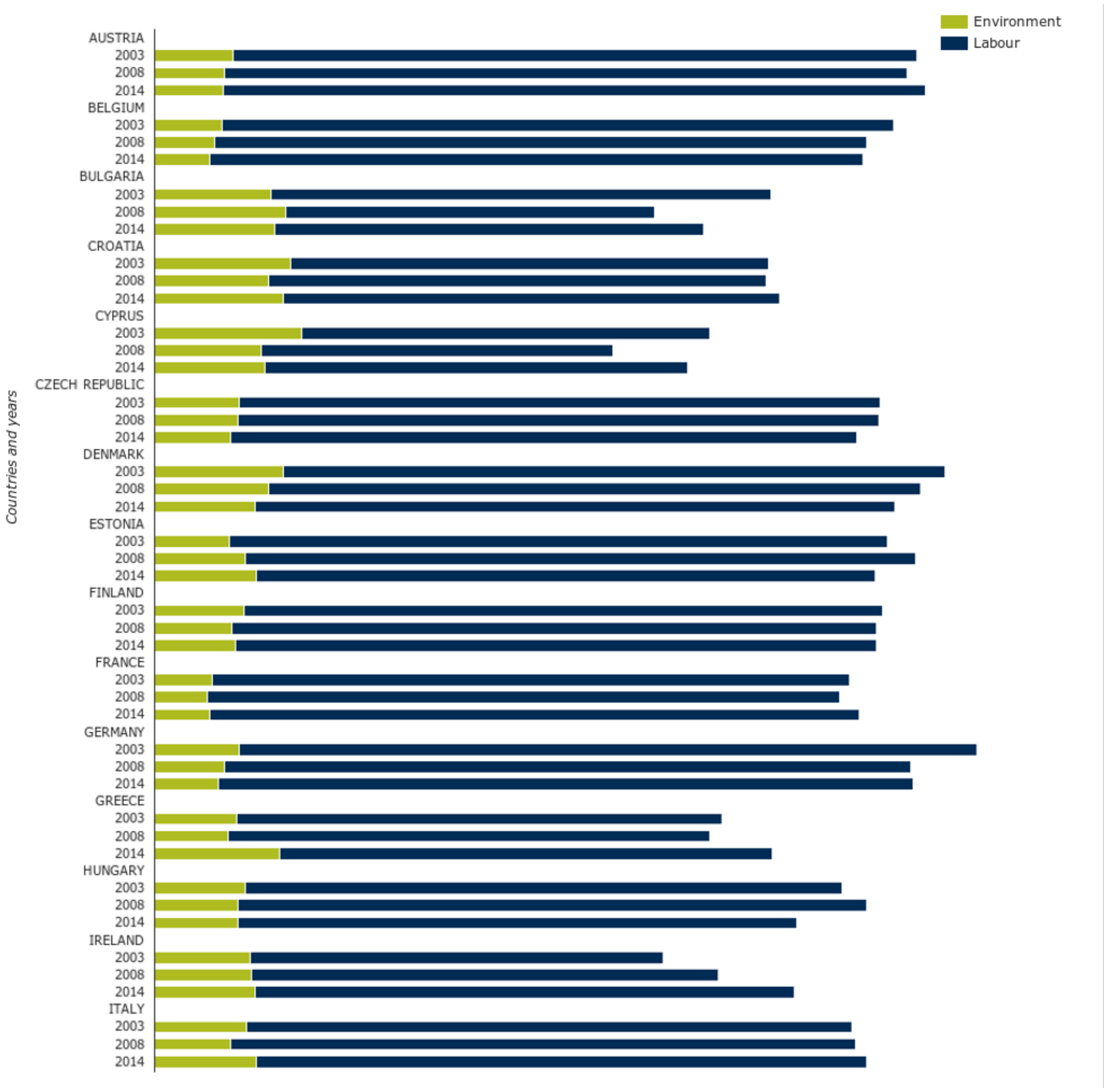
Another factor that limits changes to the relative levels of taxes is the high level of political attention that is generated by any changes to a country's tax system. This can make any changes difficult and will tend to slow the pace of change. The political difficulties of modifying the fiscal system are reflected in a recent study by the European Commission, which assessed the environmental fiscal reform potential for the EU for different scenarios of political acceptance in various Member States (EC, 2016).

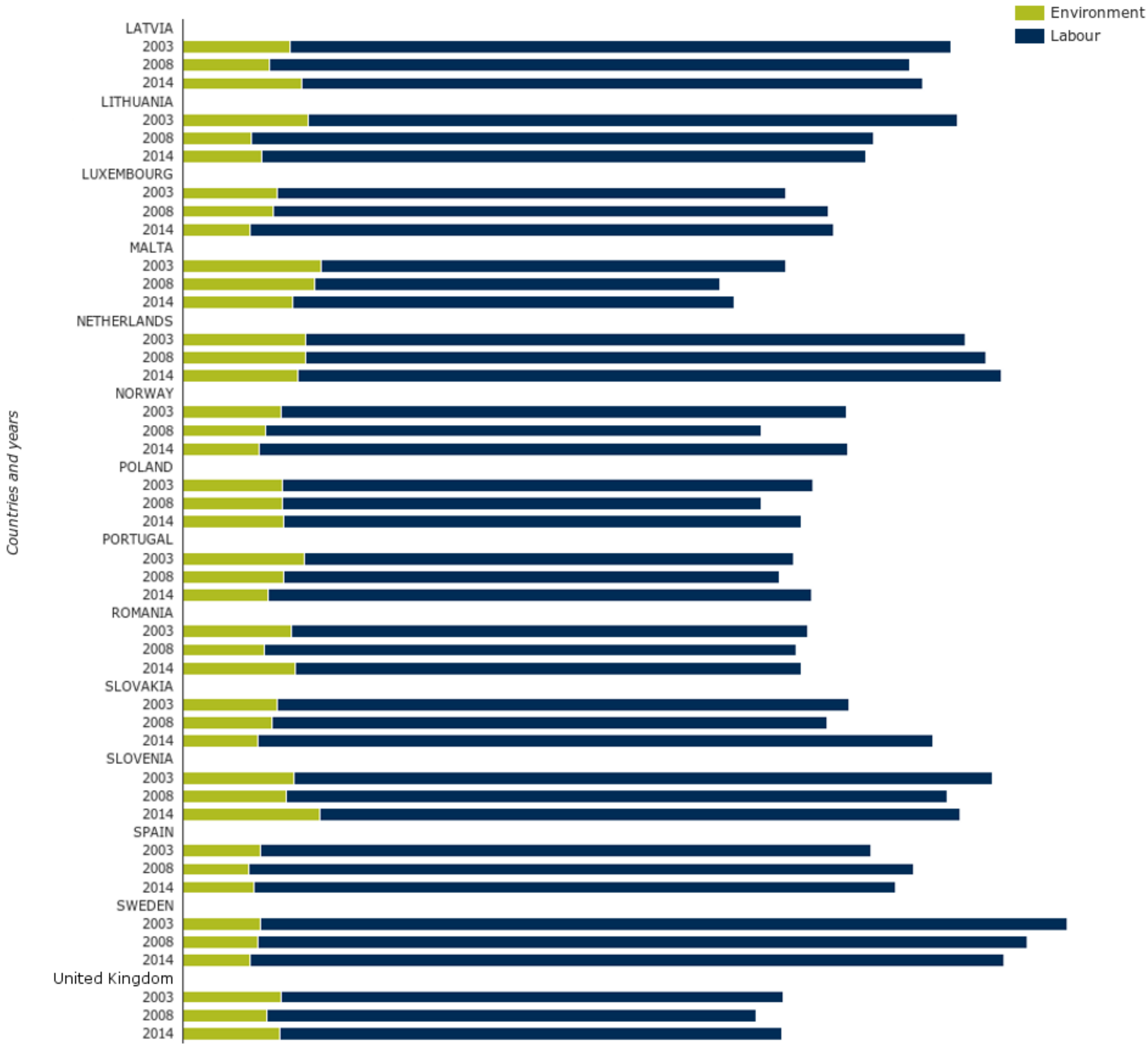
The absence of policies promoting a tax shift from labour to environmentally damaging goods and practices over past years, and the lack of plans by Member States to implement these changes, makes it unlikely that the 2020 objective will be met.

Country level information

When comparing the levels of environmental taxation between European countries, differences should be analysed with caution. For example, low revenues from environmental taxes can result from relatively low environmental tax rates, or from modified behavioural patterns resulting from high tax rates. On the other hand, higher levels of environmental tax revenues in a country could result from low tax rates that incentivise non-residents to purchase taxed products from the other side of a border (as is the case for petrol or diesel) (Eurostat, 2016).

Figure 3. Shares of environment and labour taxes in total tax revenues from taxes and social contributions





Data sources:
Eurostat. Shares of environmental and labour taxes in total tax revenues from taxes and social contributions (tsdgo410)
European Commission. Data on taxation

Explore interactive version

Figure 3 illustrates the large differences in the share of labour taxation in 2014 between countries, ranging from 32.9 % in Bulgaria to 58.6 % in Sweden. In 2014, only three EU Member States (Croatia, Greece and Slovenia) showed a share of above 10 % of environmental taxes in total revenues from taxes and social contributions.

Five countries shifted taxation away from labour and towards the environment between 2003 and 2014 (Bulgaria, Estonia, Latvia, Poland and Slovenia), while 10 countries moved in the opposite direction (Austria, Croatia, Cyprus, Finland, France, Luxembourg, Portugal, the Netherlands, Slovakia and Spain); however, some of these changes are quite small.

The 2015 review of tax reforms in Member States by the European Commission (EC, 2015b) identified a group consisting of approximately one third of EU Member States where there is particular scope for improving the design of environmental taxes. Suggested ways forward include restructuring vehicle taxation, indexing environmental taxes to inflation and adjusting fuel excise duties to reflect the carbon and energy content of different fuels.

Outlook beyond 2020

A recent report by the European Commission analysed the extent to which environmental taxes could be increased, based on good practice (EC, 2016). This report found that environmental taxes could increase across the EU from an average of 2.5 % of GDP in 2013 to 3.6 % by 2030. Countries reported that politically feasible increases in environmental taxes, especially energy taxes, are lower than estimated optimal rates. However, this gap reduces as one looks further into the future. The report concluded that, while, in the short term, the good-practice scenario is viewed as challenging, over the longer term nearly all the suggested taxes can be viewed as politically feasible.

The fiscal outlook in Europe has heightened political interest in the potential of revenue-neutral tax-shifting policies whereby the revenues from environmental taxes are used to reduce labour taxes. Longer term developments, including demographic changes and technological breakthroughs on energy and transport in the transition to a low-carbon, green economy, will contribute to the erosion of the current tax bases in European countries. These expected trends challenge the overall basis of current thinking on tax shifts. Some countries have already developed new environmental tax instruments, but much more work needs to be done on the design of resilient, long-term tax systems in Europe in the face of such systemic challenges (EEA, 2016).

About the indicator

Environmental taxes are defined as taxes whose tax base is a physical unit (or proxy of it) of something that has a proven, specific negative impact on the environment. Current environmental tax revenues stem from four types of taxes: energy taxes, transport taxes, pollution taxes and resource taxes. Pollution and resource taxes are reported for only 16 EU Member States, with Eurostat estimating the tax levels for the remaining countries.

Taxes on labour are defined as all personal income taxes, payroll taxes and the social contributions of employees and employers that are levied on labour income (both employed and non-employed).

Eurostat gathers data on environmental taxes for four categories (energy, transport, pollution and resources) using Table 9 from the European System of Accounts transmission programme. Since 2013, Eurostat has also collected data on environmental taxes by economic activity at a more detailed level, in application of Regulation (EU) No 691/2011 on European environmental economic accounts. The methodological basis is outlined in the Eurostat publication 'Environmental taxes — A statistical guide' (Eurostat, 2013).

Footnotes and references

Barrios, S., Fatica, S., Martinez, D. and Mourre, G., 2014,The fiscal impact of work-related tax expenditures in Europe, European Economy, Economic Papers 545, February 2015, European Commission Directorate General for Economic and Financial Affairs, Brussels.

EC, 2011, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Roadmap to a Resource Efficient Europe' (COM(2011) 571 final of 20 September 2011), Brussels (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0571&from=EN).

EC, 2015a, Closing the loop — An EU action plan for the circular economy (COM(2015) 614/2) (http://ec.europa.eu/priorities/jobs-growth-investment/circular-economy/docs/communication-action-plan-for-circular-economy_en.pdf).

EC, 2015b, Tax reforms in EU Member States 2015 — Tax policy challenges for economic growth and fiscal sustainability, Institutional Paper 008 (http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip008_en.pdf).

EC, 2016, Study on assessing the environmental fiscal reform potential for the EU-28(http://ec.europa.eu/environment/integration/green_semester/pdf/Eunomia%20EFR%20Final%20Report%20MAIN%20REPORT.pdf).

EEA, 2013, 'Green fiscal reform can create jobs and stimulate innovation across the EU', European Environment Agency (http://www.eea.europa.eu/highlights/fiscal-reform-can-create-jobs).

EEA, 2016.Environmental taxation and EU environmental policies, EEA Report No 17/2016, European Environment Agency.

EU, 2013. Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annex A, paragraph 86 (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2013, Environmental taxes, a statistical guide. (http://ec.europa.eu/eurostat/documents/3859598/5936129/KS-GQ-13-005-EN.PDF/706eda9f-93a8-44ab-900c-ba8c2557ddb0?version=1.0), last accessed 14/11/2016.

Eurostat, 2014, Taxation trends in the European Union—Data for the EU Member States, Iceland and Norway (http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/2014/report.pdf).

Eurostat, 2015, 'Shares of environmental and labour taxes in total tax revenues from taxes and social contributions (code tsdgo410)' (http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdgo410&language=en).

Eurostat, 2016, 'Statistics explained — Environmental tax statistics'. (http://ec.europa.eu/eurostat/statistics-explained/index.php/Environmental_tax_statistics), last accessed 14/11/2016.

IEEP, 2015, 'Overcoming obstacles to green fiscal reform', paper presented to the Third Annual Conference on Fiscal Policies and the Green Economy Transition: Generating Knowledge — Creating Impact, 29–30 January 2015, University of Venice, Venice, Italy, Institute for European Environmental Policy, London and Brussels.

AIRS briefings

AIRS_PO2.1, 2016, Resource efficiency, European Environment Agency .

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Environmental Goods and Services Sector: employment and value added

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Employment and value added in the environmental goods and services sector	▲	Promote a larger market share of green technologies in the Union and enhance the competitiveness of the European eco-industry - 7th EAP	●
Overall employment and value added continue to increase, although growth in the sector has slowed since 2011. The prospects of continued growth are uncertain and dependant on the sector competing with equivalent sectors in China and the USA, and continuing ambitious renewable energy and green growth policies in Europe			

The Seventh Environment Action Programme (7th EAP) calls for strengthening the market share of green technologies and enhancing the competitiveness of eco-industries by 2020. The Environmental Goods and Services Sector (EGSS) has grown consistently faster than the rest of the EU economy, in terms of both employment and value added over the 2003–2013 period. The EGSS was largely unaffected by the economic downturn, with output growing by more than 50 % over this period and employment reaching over 4 million full-time equivalents. This is partly because of an increase in public sector spending on green infrastructure in the years since the economic downturn, but has mainly been driven by growth in the renewable energy sector. Growth in the EGSS has slowed since 2011, as a result of increasing global competition and a reduction in domestic investments in renewable energy. The EGSS will need to retain global competitiveness to achieve the 2020 7th EAP objective. This could be aided by continuing ambitious renewable energy and green growth policies in Europe.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

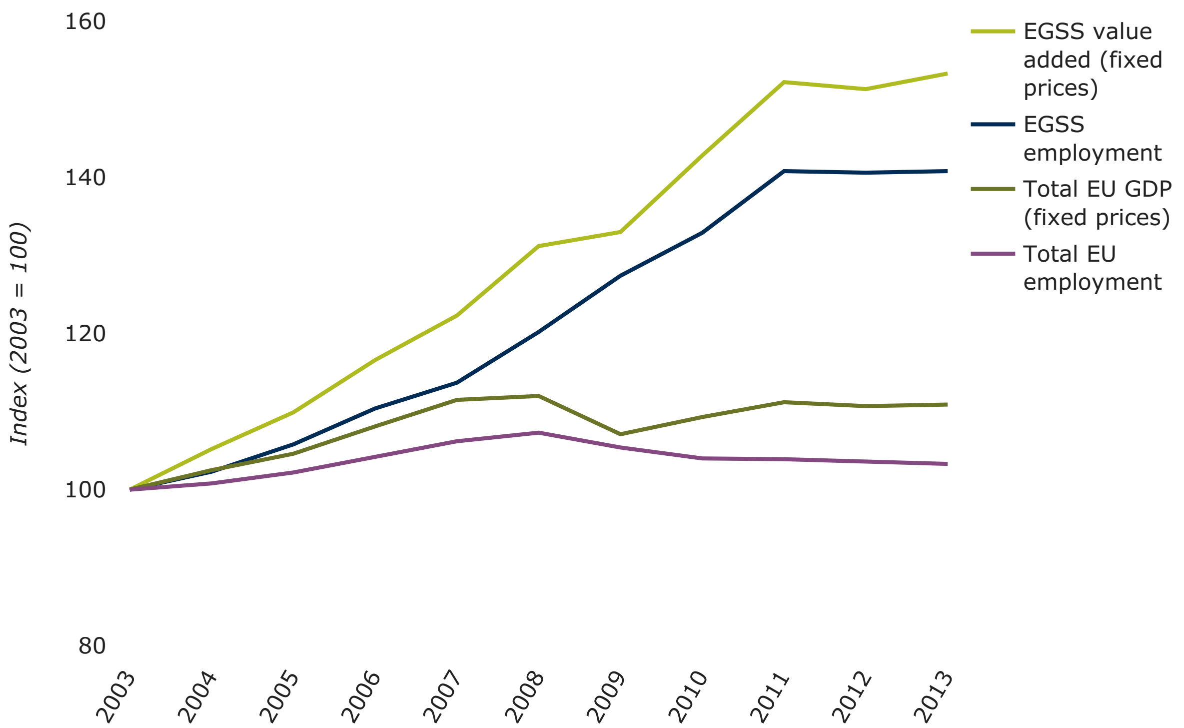
The 7th EAP (EU, 2013) calls for strengthening the market share of green technologies in the European Union and enhancing the competitiveness of European eco-industries. This will not only reduce the environmental impacts of the economy but could also have important socio-economic benefits in terms of value added and employment. This briefing presents trends in value added and employment in the EGSS. This reflects the objectives of the Europe 2020 Strategy towards a sustainable economy (EC, 2010), including growing employment in the green economy (EC, 2012). In the context of globalisation and technological change, the green economy offers potential for growth. Europe as a global leader in the development of environmental goods and services has significant potential for exporting this expertise (EC, 2015a).

Policy targets and progress

The increased awareness of the need to combat environmental pollution and preserve natural resources has expanded compliance obligations within the environmental acquis and increased the supply and demand of environmental goods and services, i.e. products to prevent, measure, control, limit, minimise or correct environmental damage and resource depletion.

The Europe 2020 Strategy does not include any targets on employment or output from the eco-industry sector, i.e. the EGSS. However, the EGSS environmental–economic account enables reporting on trends in output and employment and so informs on progress towards a green economy. The EGSS encompasses **environmental protection activities** — related to preventing, reducing and eliminating pollution and any other degradation of the environment — and **resource management activities** — which include management of energy resources (renewable energy production and equipment and installations for heat and energy saving).

Figure 1. Employment and value added in the Environmental Goods and Services Sector (EGSS) compared with the whole economy, EU



Data sources:
a. Eurostat. Production, value added and exports in the environmental goods and services sector (env_ac_egss2)
b. Eurostat. Employment in the environmental goods and services sector (env_ac_egss1)
c. Employment and activity by sex and age - annual data (lfsi_emp_a)
d. Eurostat. GDP and main components (output, expenditure and income - nama_10_gdp)

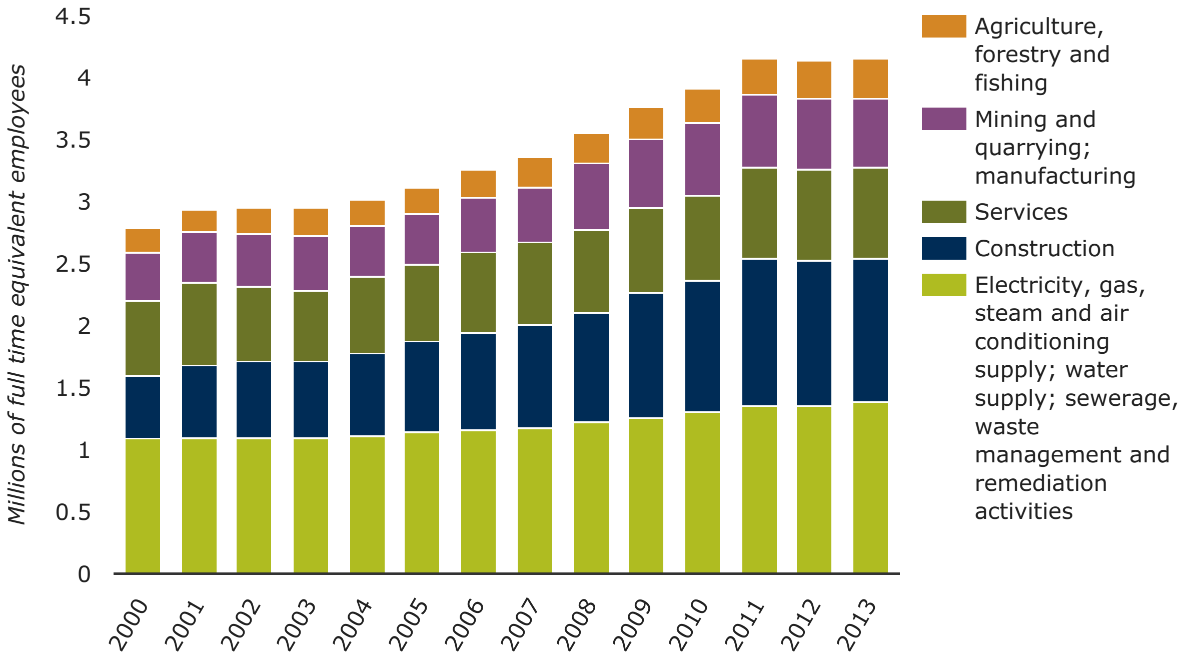
Figure 1 shows that, since 2003, the EGSS has seen faster growth in employment and value added than the total EU economy on average. The sector's contribution to gross domestic product (GDP) has grown from 1.4 % in 2000 to 2.1 % in 2013, and its contribution to total employment in the EU has grown from 2.8 million full-time equivalents (FTEs) to 4.2 million over the same period.

The continued expansion of the EGSS, even in the years immediately following the financial downturn, partially resulted from innovation and Europe's competitiveness in the global market, but it was also supported by public spending on environmental protection and renewable energy (Görlach et al., 2014; AIRS_PO2.13, 2016[1]). Some of the most successful government interventions have been investment support schemes, which provided investors with a high degree of investment certainty. Especially in difficult economic times, governments can play a significant role in supporting private investment in the EGSS by guaranteeing the certainty needed by investors (Görlach et al., 2014).

Growth in both environmental protection activities and resource management activities has been strong but has been particularly high in the resource management area, whose value added grew from EUR 50.7 billion in 2003 to EUR 116.7 billion in 2013 (at 2010 prices). While the renewable energy sector was the key driver in this growth, environmental protection activities still represent the major element of the EGSS, with a value added of EUR 156 billion in 2013.

EU employment in environmental protection and resource management activities was estimated at 4.2 million FTEs in 2013 (Figure 2). Employment trends were mainly driven by the growing importance of activities that manage energy resources, in particular the production of energy from renewable sources, the production of wind and solar power stations and equipment and installations for heat and energy saving (Eurostat, 2016).

Figure 2. Employment by activity in the Environmental Goods and Services Sector, EU



Data sources: Eurostat. Production, value added and employment by industry groups in the environmental goods and services sector (env_ac_egss3)

Despite the successes of the sector, recent trends are not so positive, with growth in employment and value added in the sector having slowed since 2011. This may be explained by increasing competition from the United States and China (Görlach et al., 2014) and a decrease in domestic investments in renewable energy. In 2013, EU investment in renewables fell by 44 % compared with the previous year as a result of ongoing uncertainty on the future of support mechanisms and lower investment capacity in some EU countries (UNEP, 2016) (AIRS_PO2.6, 2016).[2] Overall, the future prospects for growth of the EGSS are strongly dependent on continuing ambitious renewable energy and green growth policies in Europe and how these impact on competition with the United States and China.

The overall increase in employment and value added in the EGSS sector is a positive development. However, a greener economy is not inclusive and socially sustainable by default, and the transition phase is likely to entail some challenges, particularly within certain sectors and certain types of jobs. Consequently, a comprehensive approach is needed that ensures that green jobs are also decent jobs that contribute to social inclusion (ILO, 2008).

Outlook beyond 2020

An expanding EGSS is a key factor in achieving low-carbon growth decoupled from resource use, as envisaged in the 7th EAP. Policies on energy efficiency and renewable energy (EC, 2015b) and waste recycling (EC, 2015c) cover a period beyond 2020, suggesting that there could be long-term growth in the EGSS. Further expansion of the EGSS could be assisted through ambitious renewable energy and green growth policies at the EU and national levels but also via more direct assistance such as investment support schemes that provide investors with a high degree of investment certainty.

About the indicator

This briefing uses data from the EGSS account, which is a module of the European environmental–economic accounts. Environmental accounts analyse the interaction between the economy and the environment by organising environmental information in a way that is consistent with national accounts. The EGSS is defined as that part of a country's economy that is engaged in producing goods and services that are used in environmental protection activities and resource management either domestically or abroad. The income created by the EGSS is expressed in terms of gross value added (at 2010 prices), which is the difference between output and intermediate consumption. Employment in the EGSS is expressed in terms of full-time equivalent jobs.

The data are broken down by industry (e.g. services, construction, etc.); environmental protection class (e.g. wastewater management, waste management, protection of biodiversity and landscapes); and resource management class (e.g. water management, energy resource management). The EGSS does not cover a number of resource management economic activities, e.g. the management of forest resources, the management of wild flora and fauna and research and development on resource management.

European environmental accounts are established by Regulation (EU) No 691/2011 on European environmental economic accounts. From 2017, reporting of data on the EGSS will be mandatory and standardised (Eurostat, 2015). Current data are a combination of Eurostat estimates with some Member State data reported through voluntary surveys. There are some comparability issues at country level in terms of coverage, time series availability and the use of different classifications or approaches for calculating employment data. For more information please see http://ec.europa.eu/eurostat/cache/metadata/en/env_egs_esms.htm.

Footnotes and References

EC, 2010, Communication from the Commission 'Europe 2020, A strategy for smart, sustainable and inclusive growth' (COM(2010) 2020 final).

EC, 2012, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Towards a job-rich recovery' (COM(2012)173 final).

EC, 2015a, 'The Environmental Goods Agreement (EGA): Liberalising trade in environmental goods and services', European Commission press release, 8 September 2015 (http://trade.ec.europa.eu/doclib/press/index.cfm?id=1116), last accessed 16/11/2016.

EC, 2015b, Communication from the Commission to the European Parliament, the Council, the

European Economic and Social Committee, the Committee of the Regions and the European Investment Bank 'A framework strategy for a resilient energy union with a forward-looking climate change policy' (COM(2015) 080 final).

EC, 2015c, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Closing the loop — An EU action plan for the circular economy' (COM(2015) 614/2).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annex A, paragraph 43 (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2015, A practical guide for the compilation of environmental goods and services (EGSS) accounts, January 2015, Eurostat Unit E2 (http://ec.europa.eu/eurostat/documents/1798247/6191549/Practical-guide-towards-compiling-EGSS-statistics-March2015.pdf/f0f8c6c1-0ae9-4f53-9c94-afcc190cc5ba), last accessed 16/11/2016.

Eurostat, 2016, 'Statistics explained — Environmental goods and services sector' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Environmental_goods_and_services_sector), last accessed 16/11/2016.

Görlach, B., Porsch, L., Marcellino, D. and Pearson, A., 2014, How crisis-resistant and competitive are Europe's eco-industries, Ecologic Institute, Berlin (http://docplayer.net/9826167-How-crisis-resistant-and-competitive-are-europe-s-eco-industries.html), last accessed 16/11/2016.

ILO, 2008, Green jobs: Towards decent work in a sustainable, low-carbon world, UNEP/ILO/IOE/ITUC (http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf), last accessed 16/11/2016.

UNEP, 2016. Global trends in renewable energy investment 2015, Frankfurt School of Finance and Management, UNEP Collaborating Centre and Bloomberg New Energy Finance, Frankfurt (http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2016), last accessed 16/11/2016.

AIRS briefings

1. AIRS_PO2.13, 2016, Environmental protection expenditure, European Environment Agency
2. AIRS_PO2.6, 2016, Renewable energies, European Environment Agency

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency

Environmental protection expenditure

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Environmental protection expenditure in Europe	(% of GDP) (absolute value at fixed prices)	Increase in public and private sector funding for environment- and climate-related expenditure - 7th EAP	
Environmental protection expenditure has increased over the years and this seems likely to continue to 2020, strengthened by the EU's decision that at least 20 % of its 2014–2020 budget should be used on climate change activities			

The Seventh Environment Action Programme (7th EAP) identifies the need to increase environment and climate-related expenditure if its environment and climate objectives are to be met. Environmental Protection Expenditure (EPE), which does not capture investment in renewables, energy efficiency and climate adaptation, increased in real terms by 18 % over the 2003–2013 period, but its proportion of gross domestic product (GDP) increased by only 7 %. To date, the highest expenditure and greatest growth in expenditure has been in waste management. Most EPE growth was driven by the public sector and specialised producers, with industry lagging significantly behind. Since at least 20 % of the EU budget should be spent on climate change activities until 2020, it is likely that EPE will continue to grow.

For further information on the scoreboard methodology please see Box I.1 in the EEA Environmental indicator report 2016

Setting the Scene

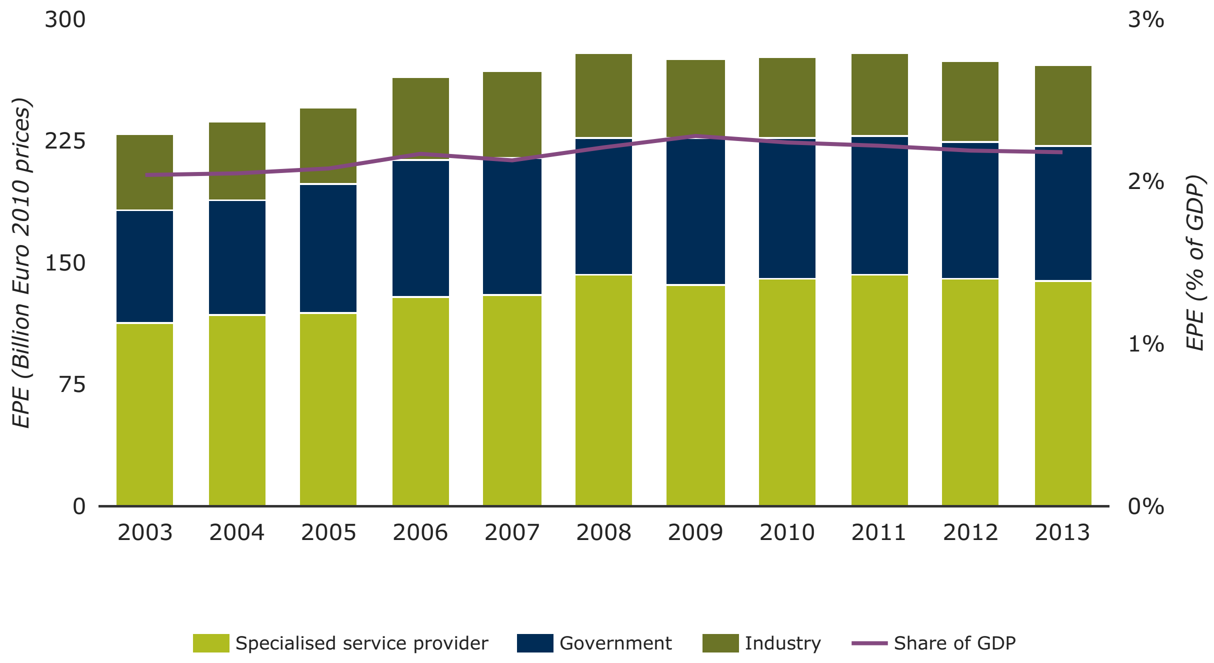
The 7th EAP calls for an increase in both public and private sector environment- and climate-related expenditure to achieve environment and climate objectives (EU, 2013). This briefing presents trends in EPE; promoting activities and technologies aimed at preventing pollution and environmental degradation can reduce the environmental and climate impacts of economic activity. This can also lead to economic development via growth and increasing employment in the environmental goods and services sector (EGSS) (AIRS_PO2.12, 2016).[1] However, increased spending can also reflect responses to growing environmental pressures and impacts on the environment.

Policy targets and progress

The 7th EAP Priority Objective 6 identifies the need to increase both public and private sector environment and climate-related expenditure. EPE has grown over the 2003–2013 period by 18 % in real terms, although most of this growth took place before 2008 (Figure 1). The proportions of expenditure of the public sector, industry and specialised producers (a mixture of public and privately run environmental specialist services such as waste and wastewater companies) remained relatively constant over the same period. Specialised producers accounted for half of total expenditure, industry for 20 % and the public sector for 30 %. Expenditure by industry has lagged behind the other two sectors, growing at half the speed.

Overall EPE experienced a dip due to the financial crisis and did not recover to 2008 levels in real terms (fixed prices) until 2011. However, the reduction was mainly driven by industry and specialised providers. Public expenditure actually increased during and immediately following the crisis as governments in EU Member States tried to stabilise their economies by increasing investments, including green investments (Görlach et al., 2014). This increasing trend in EPE in the public sector also protected the EGSS in Europe from the economic downturn (AIRS_PO2.12, 2016).[1] However, it should be noted that the main reason for growth in the EGSS was a continuous increase in renewable energy activities, and the EPE indicator does not capture this.

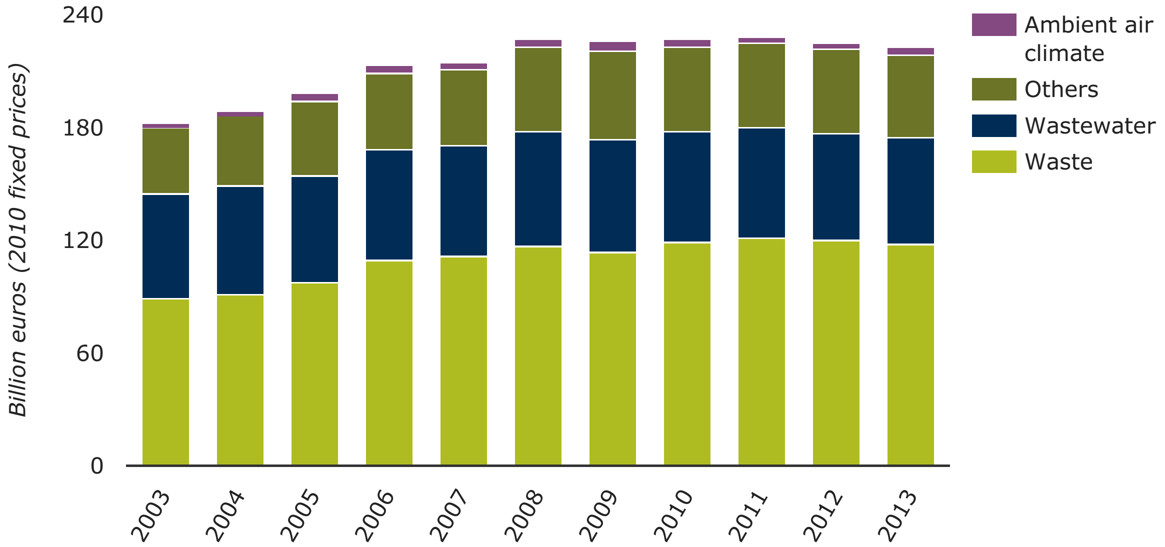
Figure 1. Trends in EU-28 environmental protection expenditure by organisation type, in absolute value (2010 fixed prices) and proportion of GDP



Data sources:
a. Eurostat. Environmental protection expenditure in Europe - EUR per capita and % of GDP (env_ac_exp2)
b. Eurostat. Environmental protection expenditure in Europe - detailed data, NACE Rev. 2 (env_ac_exp1r2)

Public expenditure on environment activities as part of policy interventions to stabilise economies also affected the proportion of overall EPE in GDP. This showed a 7 % increase over the 2003–2013 period with a peak in 2009, following 2 years of increased government expenditure (from EUR 85 billion in 2007 to EUR 90 billion in 2009), while the overall economy shrank. Public sector EPE then dropped to EUR 86 billion in 2010 (at 2010 prices), then stagnated after 2009 as the economy began to grow again, reducing the EPE proportion of GDP to 2006 levels by 2013.

Figure 2. Environmental protection expenditure by specialised producers and the public sector split by environmental domain, EU



Data sources:	Eurostat. Environmental protection expenditure in Europe - detailed data (NACE Rev. 2) (env_ac_exp1r2)

Figure 2 shows EPE trends according to environmental domain in the same period. Data are available only for the public sector and specialised producers (approximately 80 % of overall EPE).

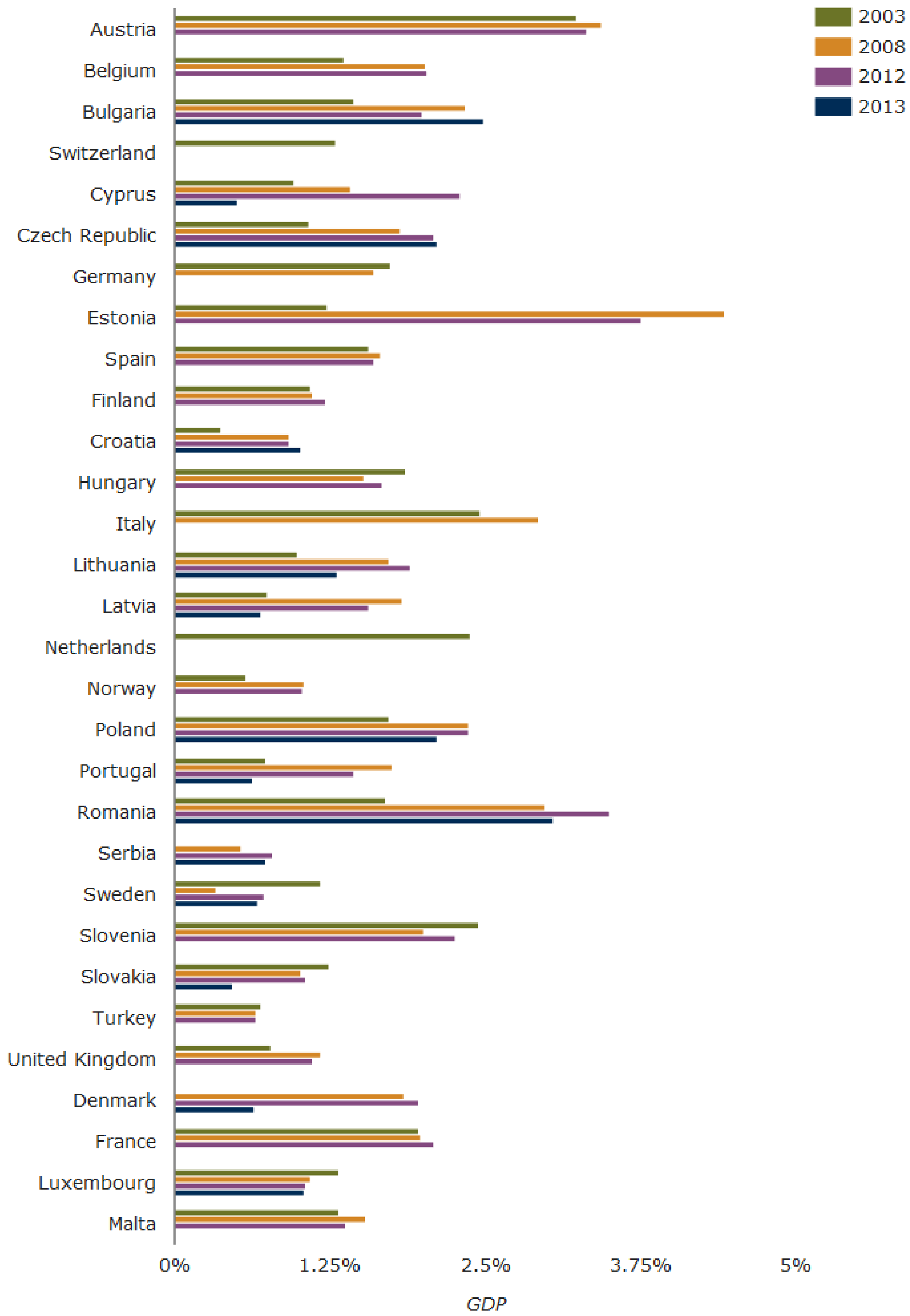
Most expenditure was on waste management, followed by wastewater treatment. The growth in EPE has been driven primarily by growth in waste management expenditure. EPE related to air pollution and climate was very limited but this is in part due to industry expenditure not being included in the figures. If this was included, it would add an extra EUR 12 billion EPE in 2013, in addition to the EUR 4 billion spent on air and climate, as shown in Figure 2 (Eurostat, 2015a).

The EPE will only partly capture climate-related expenditure. Nevertheless, given current EU budget allocation commitments and the clear increase in EPE since 2003, it seems unlikely that this trend will be reversed by 2020. Therefore, the prospects for increased environmental expenditure by 2020 appear positive.

Country level information

Figure 3 shows developments at country level in total EPE as percentages of GDP in the 2003–2013 period, where data are available. While trends varied between countries, of the 11 countries with data for all 3 years, eight saw increasing proportions of GDP.

Figure 3. Environmental protection expenditure as a percentage of GDP



Data sources: Eurostat. Environmental protection expenditure in Europe (env_ac_exp2)

EPE as a proportion of GDP varies strongly across countries. Austria, Estonia, Italy and Romania have proportions over 3 % while Serbia and Turkey have proportions lower than 0.75 % (Figure 3). This wide gap reflects differences in economic structure (e.g. type of industry, type of energy sources used). In most countries, public sector expenditure is concentrated on waste management and wastewater treatment.

The division between EPE current expenditure and investment differs across countries according to the date when they entered the EU. For Member States that have joined the EU since 2004, investment accounts for more than 35 % of total EPE. This expenditure can be explained by the new fixed assets necessary to meet EU water quality and waste management directives.

Outlook beyond 2020

Progress towards a circular economy will require increases in investments and current expenditure in the waste management sector, but also within the business sector as a whole, to close resource loops. The EU intends to invest EUR 5.5 billion of structural funds in accelerating the circular economy (EC, 2015). This could also provide a catalyst for expenditure by the public sector and businesses in Member States up to and beyond 2020.

The EU's agreed long-term target (EC, 2014) for further reducing greenhouse gas emissions (a 40 % reduction compared with 1990 by 2030) also implies additional investments, not all of which will be captured by the EPE indicator. The air quality targets for 2030 proposed by the European Commission in late 2013 ('A Clean Air Programme for Europe'; EC, 2013b) could also lead to an increase in EPE beyond 2020. Additional efforts will be needed beyond 2020 to achieve the water quality targets of the Water Framework Directive (EU, 2000) which are also likely to be reflected in an increase in EPE.

About the indicator

This briefing uses data from the environmental protection expenditure account (EPEA), which is one of the European environmental accounts. Environmental accounts analyse the interaction between the economy and the environment by organising environmental information in a way that is consistent with national accounts. EPE illustrates the investments aimed at preventing, reducing and eliminating pollution and environmental degradation. The EPE indicator estimates country spending on these activities in fixed prices (2010 reference year) in euros and as a percentage of GDP.

EPE data are available by environmental domain (protection of ambient air and climate; wastewater management; waste management; protection and remediation of soil, groundwater and surface water; noise and vibration abatement; protection of biodiversity and landscape; protection against radiation; research and development; and other environmental protection activities). EPE data are also available by type of organisation (public, industrial and specialist producers, which can be a mixture of public and privately run environmental specialist services such as waste management companies etc.). EPE can also be split between investments and current (ongoing) expenditure.

European environmental accounts are established by Regulation 691/2011 on European environmental economic accounts. From 2017, reporting of data on the EPEA will be mandatory and standardised. Currently, data on expenditure by certain sectors, particularly industry, is missing in some years for some countries, and in these cases it is estimated by Eurostat. Moreover, industry EPE data broken down by environmental domain are missing.

Although the EPEA includes investment in reducing air pollutants (including greenhouse gases), it does not capture investment in renewable energy, energy efficiency or any form of climate adaptation. Therefore it does not fully capture expenditure to achieve climate policy objectives.

Footnotes and references

EC, 2013a, 'An EU budget for low-carbon growth', European Commission press release, Warsaw, 19 November 2013 (http://ec.europa.eu/clima/policies/budget/docs/pr_2013_11_19_en.pdf), accessed 16/11/2016.

EC, 2013b, Commission staff working document 'Impact assessment' (SWD(2013) 531 (http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf), accessed 16/11/2016.

EC, 2014, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'A policy framework for climate and energy in the period from 2020 up to 2030' (COM(2014) 015 final);

EC, 2015, 'Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth', European Commission press release, Brussels, 2 December 2015 (http://europa.eu/rapid/press-release_IP-15-6203_en.htm), accessed 16/11/2016.

EU, 2000, Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73).

EU, 2013, Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet', Annexe A, paragraph 84b (OJ L 354, 28.12.2013, p. 171–200).

Eurostat, 2015a, 'Statistics explained — Environmental protection expenditure' (http://ec.europa.eu/eurostat/statistics-explained/index.php/Environmental_protection_expenditure), accessed 16/11/2016.

Eurostat, 2015b, 'Environmental protection expenditure in Europe —EUR per capita and % of GDP' (http://ec.europa.eu/eurostat/en/web/products-datasets/-/ENV_AC_EXP2), accessed 16/11/2016.

Görlach, B., Porsch, L., Marcellino, D. and Pearson, A., 2014, How crisis-resistant and competitive are Europe's Eco-Industries?Ecologic Institute, Berlin (http://docplayer.net/9826167-How-crisis-resistant-and-competitive-are-europe-s-eco-industries.html), accessed 16/11/2016.

AIRS briefings

1. AIRS_PO2.12, 2016, Environmental goods and services sector: Employment and value added, European Environment Agency.

Environmental indicator report 2016 – In support to the monitoring of the 7th Environment Action Programme, EEA report No30/2016, European Environment Agency