7th EAP Priority Objective 2:

To turn the Union into a resource-efficient, green and competitive low-carbon economy

European Environment Agency

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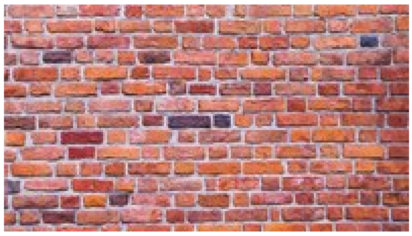
Resource efficiency



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 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.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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. Resource productivity — economic output per unit of material used — provides a proxy for resource efficiency. Between 2000 and 2016, resource productivity in the EU increased by 41 %. This is a positive development. However, most of this increase occurred since 2008, and resulted mainly from a decline in the use of non-metallic minerals primarily because of the reduced activity in the material-intensive construction industry, which was strongly affected by the 2008 economic downturn. Some of the resource productivity increase over the 2000-2016 period was also the result of a structural decline in the use of fossil fuels. The longer term improving trend in resource productivity is expected to continue until 2020.

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. Absolute decoupling means that resource use declines or remains stable under conditions of economic growth.

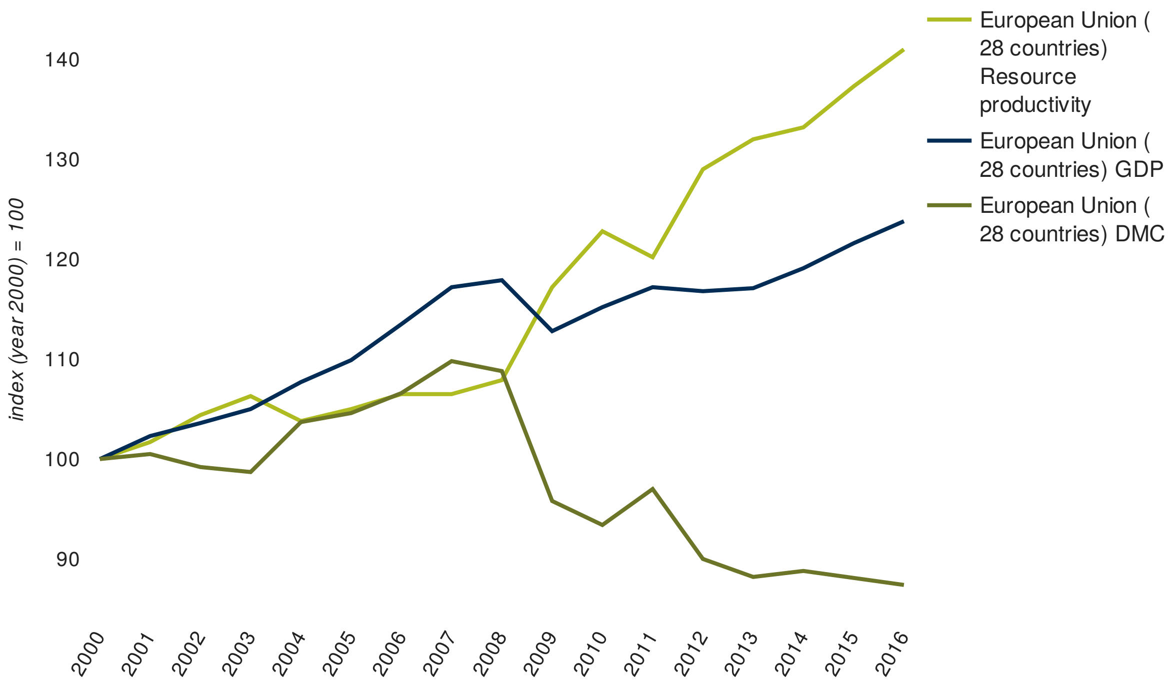
Policy targets and progress

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.

The broad objectives of the ‘Resource-efficient Europe’ flagship initiative become operational in the Roadmap to a Resource Efficient Europe (EC, 2011b), the goal of which 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). Additional insights on raw material supply are provided in the Raw Materials Scoreboard (EC, 2016).

Figure 1. Resource productivity, domestic material consumption (DMC) and gross domestic product (GDP), EU



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

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

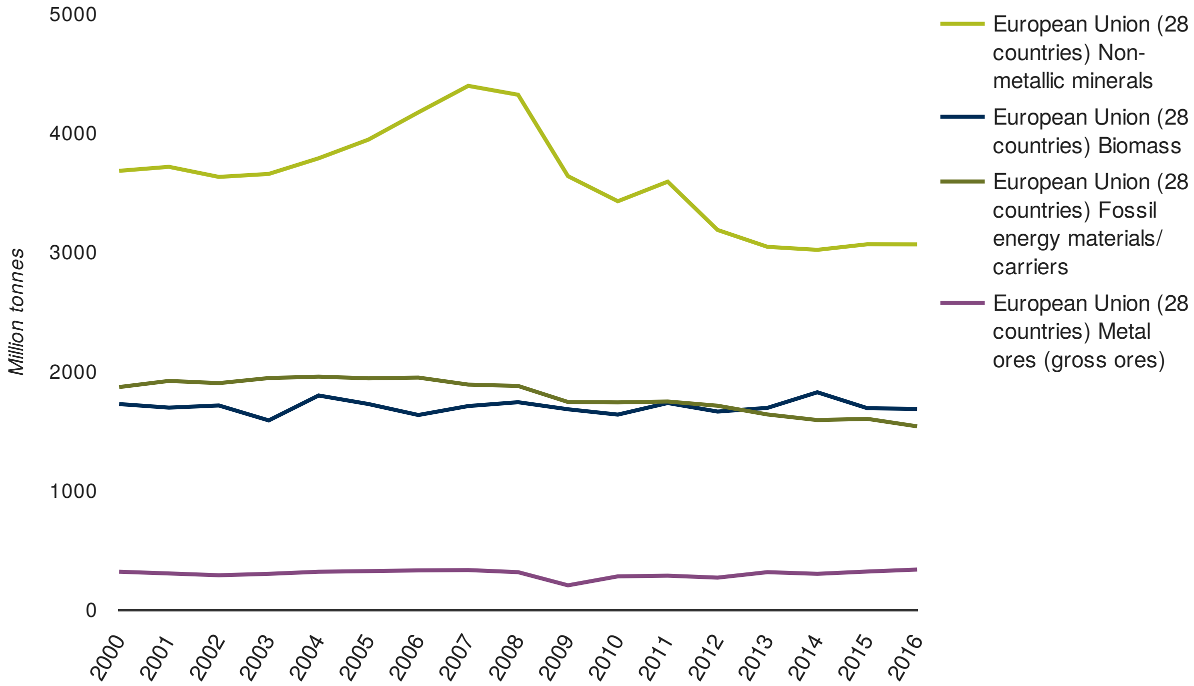
Figure 1 shows that resource productivity increased by 41 % between 2000 and 2016, with most of the improvement occurring after 2008. Although there were some fluctuations, 2000-2007 was a period during which material use (domestic material consumption, DMC) saw relative decoupling from economic growth (gross domestic product, GDP). In other words, material use grew but at a slower rate than that of the economy. The period from 2007 onwards is characterised by absolute decoupling, as material use declined while GDP increased.

Overall, Europe appears to be extracting more value from the material resources it uses. While this is indeed a positive development, 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 impact of the 2008 economic downturn, the changing structure of countries' economies, globalisation and increasing reliance on imports, and even the nature of the indicator itself (EEA, 2016).

Since 2008, a very important factor in the resource productivity improvement was the 2008 economic downturn that followed the global economic crisis. The economic downturn affected the material-intensive industries of manufacturing and construction more than it affected services, which typically are less material intensive (Eurostat, 2017a).

The 20 % drop in total material use between 2008 and 2016 was largely due to a 29 % decline in the demand for non-metallic minerals (Figure 2). This was mainly caused by a slump in the construction sector where gross value added (in chain-linked volumes, reference year 2010) fell by about 17 % over the same period (Eurostat, 2017b).

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, 2017c) but contributed only 5.7 % of its total economic output (Eurostat, 2017b). Therefore, this sector had a relatively low resource productivity, compared with the economy as a whole. The shrinkage in this sector, as occurred between 2007 and 2016, therefore led to an increase in the resource productivity of the whole economy.

Another factor contributing to the resource productivity improvements is the decline in the consumption of fossil fuels since 2004. While this decline accelerated immediately after the economic downturn, it 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. For example, services increased their contribution to the EU economy from 71.8 % in 2006 to 73.9 % in 2016 (Eurostat, 2017d).

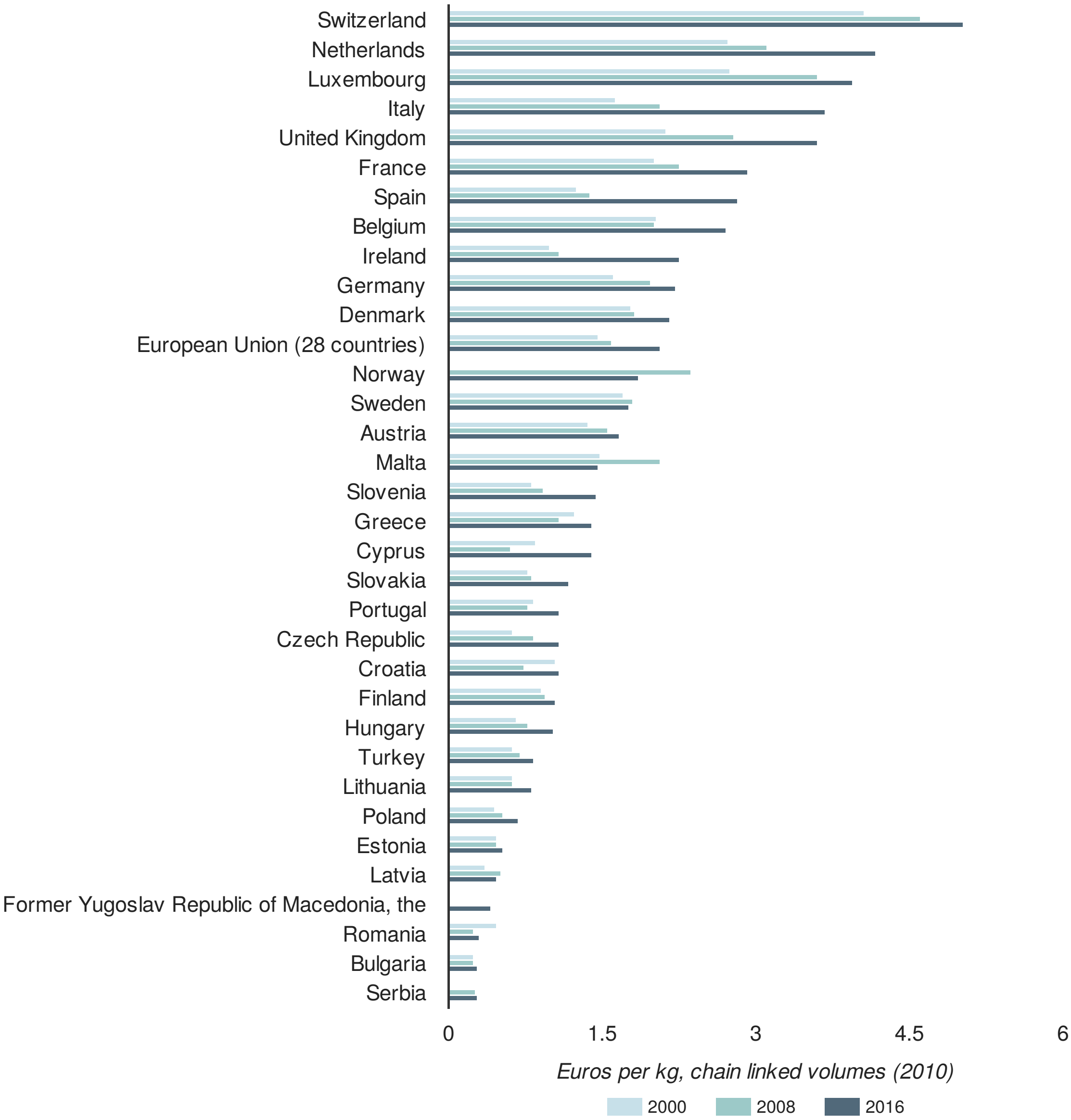
Regarding the possible impact on resource productivity by outsourcing material-intensive production to other parts of the world, at present there is no sufficient information to determine this and further investigation would be necessary to find out its effects (Eurostat, 2017a).

Detailed projections of material use within the four main material groups from 2012 to 2030 have been carried out for the European Commission, to explore possible developments of EU resource productivity. 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 does not only reflect how efficient an economy of one country is compared with another, but is also influenced by the types of material resources available in the country and the structure of its economy. 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). It is nevertheless noteworthy that over the 2000-2016 period, the five countries with the highest resource productivity levels since 2000 demonstrated much higher resource productivity improvement rates compared with the five countries with the lowest resource productivity levels since 2000 (EEA calculation based on Eurostat, 2017a).

Figure 3. Resource productivity by country



Data sources: Eurostat. Resource productivity

Note: Resource productivity is measured in Euros (chain-linked volumes, reference year 2010) per kilogram of domestic material consumption (euroCLV2010/kg DMC). Differences between individual countries would be smaller if resource productivity was measured using GDP in purchasing power standards. However, for the sake of consistency with the rest of the briefing which primarily focuses on trends over time, Figure 3 shows resource productivity in Euro CLV2010.
2014 is the latest year for Turkey and 2015 is the latest year for Norway, Serbia and Switzerland; 2000 is missing for Norway and Serbia.

The countries with the highest resource productivity in the EU are the Netherlands, Luxembourg, Italy and the United Kingdom, with values more than 75 % higher than the EU-28 average. Resource productivity improved in all but two Member States between 2000 and 2016. The exceptions were 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 demand for non-metallic minerals, as a result of a post-downturn slump in the construction sector, and in part are also due to long-term reductions in the consumption of fossil fuel carriers. The countries that experienced the sharpest decline in material use for non-metallic minerals between 2008 and 2016 were: Italy, Spain, Cyprus, Ireland, Netherlands and Greece, ranging from a 69 % reduction in the case of Italy to a 54 % reduction in the case of Greece.

It is hard to determine whether policy has had an effect or not. As of 2016, 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) and, in the last couple of years, a national circular economy action plan or roadmap.

Moreover, nine EU Member States (Austria, Estonia [1], 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 26 EU Member States whose resource productivity improved between 2000 and 2016, eight (Bulgaria, Estonia, Lithuania, Sweden, Latvia, Croatia, Slovakia and Poland) have, nevertheless, experienced an increase in demand for materials of between 17 % (Poland) and 46 % (Bulgaria) over the same period. The two countries that did not achieve improvements in resource productivity saw even higher increases in material use — material use rose by 181 % in Romania and 64 % in Malta (Eurostat, 2017c). 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, 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 (EEA, 2016). 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 strengthening their approach to 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 expressed as domestic material consumption (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 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. 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).

Last but not least, it should be kept in mind that economy-wide material flow indicators do not fully capture environmental pressures caused by material use. Both in DMC and RMC, all material types are given equal significance and are measured in tonnes, even though there are large differences in their scarcity or in the impacts related to their extraction and use. Different tools can be used for specific analysis of impacts or pressures of individual materials.

Footnotes and references

[1] Please note that since the new Coalition Agreement in Estonia this target is no longer in force.

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Published on 30 Nov 2017

Resource efficiency and low carbon economy

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 (excluding major mineral wastes) — absolute and per capita levels	EU	EEA	Reduce absolute and per capita waste generation — 7th EAP	

The past trend (2010–2014) is relatively stable and shows variation in waste generation among sectors, with reductions in some, little change in others and some increases. This mixed picture, as well as methodological uncertainties, suggest that the outlook to 2020 is unclear

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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 generated waste, excluding major mineral wastes, is used as the indicator to track progress towards waste generation reduction. The amount of this waste remained relatively stable in the EU between 2010 and 2014 - it increased slightly by 1.9 % in absolute amounts and by 1.1 % per capita. Waste generation decreased in the services; agriculture, forestry and fishing; manufacturing; and household sectors. However, waste from the construction and the energy and extraction sectors increased, while waste in the water and waste sector that includes secondary waste, increased sharply. The increase in the generation of secondary waste, triggered by a move away from landfilling towards recycling and incineration, seems to be the major driver for the slight increase of waste generation over the 2010-2014 period. The overall variation in sector trends, combined with the methodological uncertainties (short time series — only three data points — and some data collection improvements in waste statistics) related to past trends prevent any conclusions on the 2020 outlook from being drawn. It is nevertheless noteworthy that the measures in the Circular Economy Package aim to reduce waste generation in the longer term, while the current positive outlook of economic growth may have the opposite effect.

Setting the scene

The 7th EAP includes an objective that, by 2020, absolute waste and per capita waste generation are in decline and waste is managed safely as a resource (EU, 2013). The waste hierarchy is the central framework for EU and national waste policies. This hierarchy gives the highest priority to waste prevention, followed by preparing for reuse, recycling, other recovery and finally disposal. Reducing the amount of waste generated means that there is less waste to manage and also, potentially, that the demand for material and energy resources and associated environmental impacts has been reduced (AIRS_PO2.1, 2017). This briefing examines the trends in waste generation by using the total amount of waste generated, excluding major mineral wastes as an indicator. For terminology and rationale of choice, see the 'About the indicator' section at the end of the briefing.

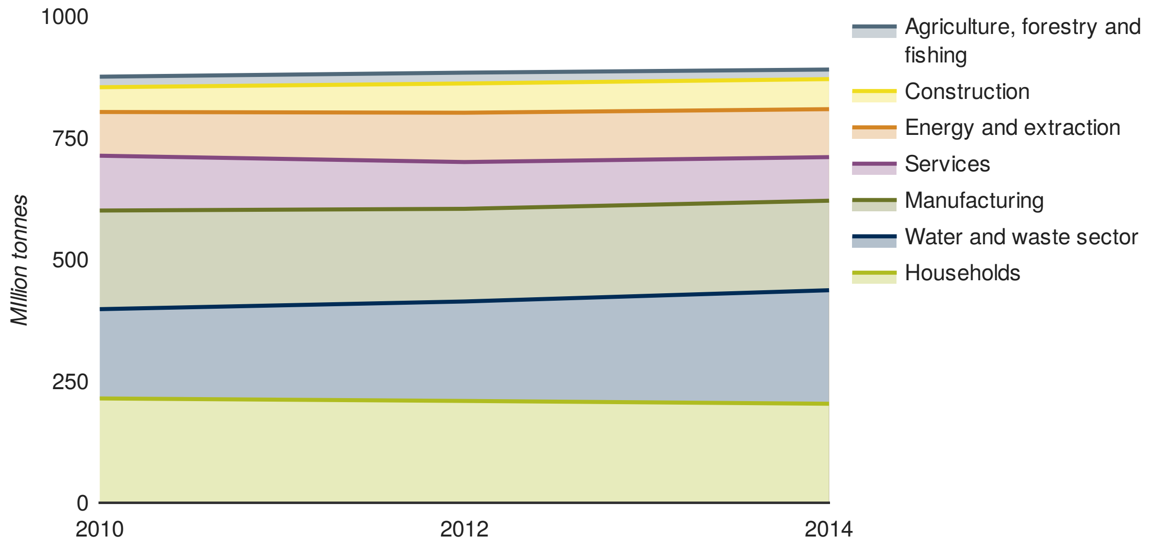
Policy targets and progress

The Roadmap to a Resource Efficient Europe contains several waste-related milestones to be met by 2020, including one that requires waste generated per capita to 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 materials 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, 2017a).

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 and, to a lesser extent, regulatory and economic instruments. A total of 17 out of 27 analysed waste prevention programmes include quantitative targets (EEA, 2015).

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



Data sources: Eurostat. Statistics on waste (env_wasgen)

The total amount of waste generated in the EU, excluding major mineral wastes, increased slightly between 2010 and 2014; it increased by 1.9 % (Figure 1). The total amount of waste, excluding major mineral wastes, increased by 2.0 % also when Liechtenstein and Norway, the two other EEA member countries for which data are available, are included (EEA, 2017b). According to the methodology of this series of indicator briefings, this trend qualifies as 'relatively stable'[1].

In 2014, the highest absolute levels of waste generation (excluding major mineral wastes) in the EU were recorded for the water and waste sector, for households, and for the manufacturing sector.

Between 2010 and 2014, there were some shifts in waste generation between sectors in the EU: reductions in waste generated by services (20 %), agriculture, forestry and fishing (9 %), manufacturing (9 %) and households (5 %). At the same time, waste generated in the construction sector, the energy and extraction sector and especially in the water and waste sector increased considerably (by 21 %, 10 % and 27 %, respectively). The reasons for these shifts are unclear. For example, waste from construction increased despite a slight decrease in construction economic activity of 0.3 % (Eurostat, 2017a). Methodological changes, such as the reallocation of waste between sectors might also have contributed to such shifts.

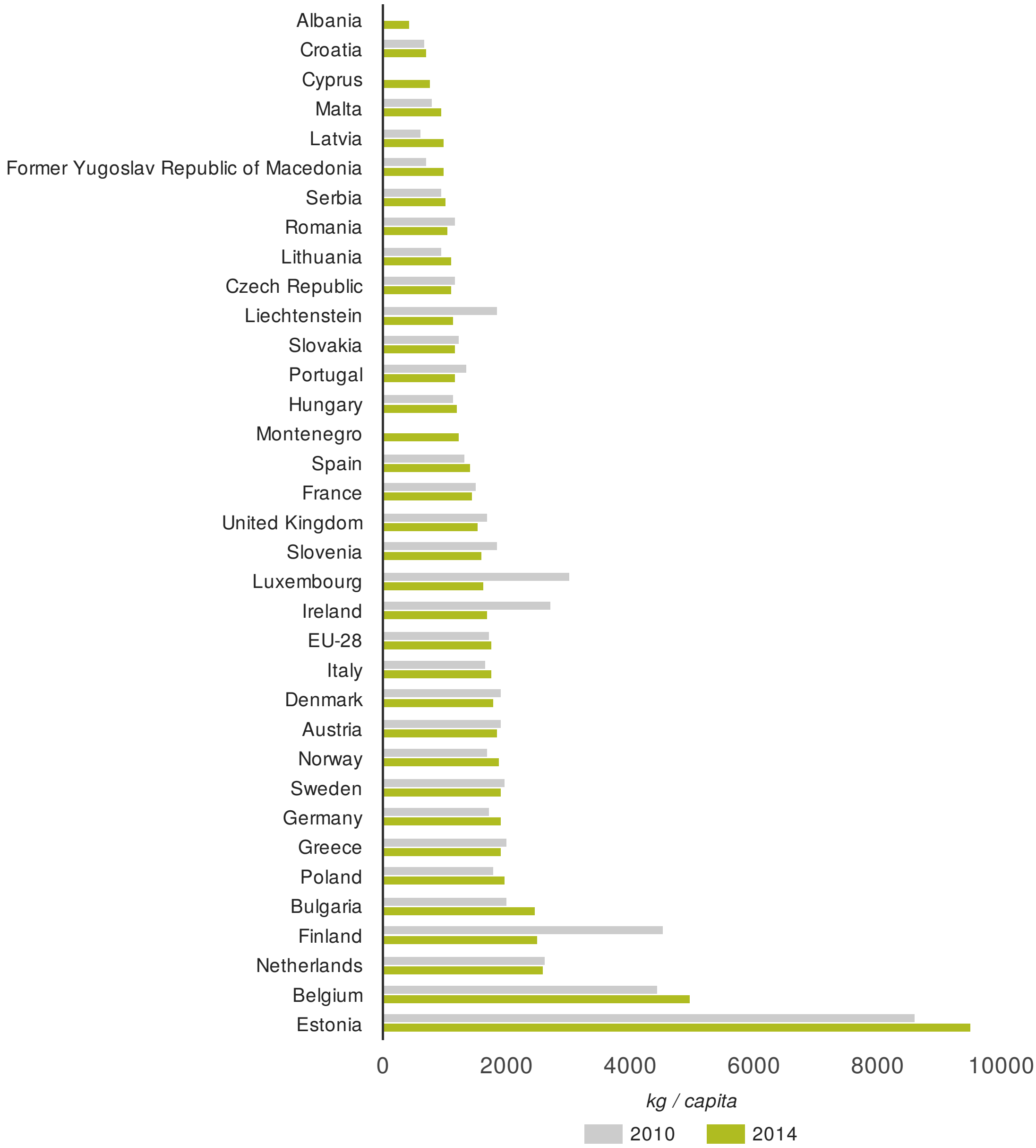
The generated waste includes secondary waste, which is accounted in the ‘water and waste sector’. The increase in secondary waste seems to be the main factor in the slightly increasing overall trend in waste generation in the 2010-2014 period. This waste is generated during the treatment of waste and comprises, for example, sorting residues, sludges and incineration ashes. More complex waste management such as recycling and incineration usually results in more secondary waste. The EU is moving away from landfilling of waste towards more recycling and incineration. For example, the share of landfilled waste (excluding major mineral wastes) decreased from 29 % to 25 % in the 2010-2014 period (Eurostat, 2017b). This development led to an increase in the amount of secondary waste generated: its share in total waste excluding major mineral wastes increased from 12 % in 2010 to 18 % in 2014.

The overall improvements and the shifts between sectors are probably due to a combination of factors including efficiency improvements in production processes and management, changes in the structure of the economy and an increase in economic activity in the services sector — this sector is not as waste intensive as others, for example, the manufacturing sector was an order of magnitude more waste intensive (0.12 kg/EUR) compared with the services sector (0.014kg/EUR) (Eurostat, 2017a). The overall improvements and the shift between sectors may also be due to methodological changes in data collection and should therefore be interpreted with caution.

In conclusion, the overall amount of waste generated has remained fairly stable, with a slight increase between 2010 and 2014, mainly because of a higher generation of secondary waste. There is significant trend variation in waste generation among sectors. In addition, only three data points can be used for the assessment — earlier data are available but strongly influenced by changes in data collection methods and therefore not used in this indicator. As a result of these uncertainties, there are currently no clear indications that total waste generation will be in decline by 2020, but rather uncertainty over the 2020 outlook. There is nevertheless a risk that waste generation may increase along with economic growth. On the other hand, measures in 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 2. Waste generation (excluding major mineral wastes) per capita, by country



Data sources: Eurostat. Generation of waste excluding major mineral wastes, kg per capita (tsdpc210)

In 2014, the EU per capita generation of waste — excluding major mineral wastes — amounted to 1 758 kg. This is 20 kg more than in 2010; a slight increase of 1.1 %, which qualifies as relatively stable per capita waste generation over the 2010–2014 period. When Liechtenstein and Norway (the two other EEA member countries for which data are available) are included in EU per capita waste generation, the trend over the 2010-2014 period continues to remain similar, with a small increase of 1.2 % being observed (Eurostat, 2017b).

Figure 2 shows that the majority of European countries generate between 1 and 2 tonnes of waste (excluding major mineral waste) per person per year. Between 2010 and 2014, half of the countries reduced their per capita waste generation, while the other half increased it. The high figures for Estonia are due to energy production based on oil shale (Eurostat, 2016a), while the high figures for Belgium include a high share of secondary wastes (Eurostat, 2016b).

Outlook beyond 2020

The long-term prospects for reducing the waste generated in the EU are uncertain. A shift to a circular economy, with increased reuse of goods and materials, has the potential to reduce waste generation. The waste prevention programmes adopted by EU Member States, Iceland and Norway can be expected to take effect towards 2020. However, the effectiveness of many of the waste prevention measures in the programmes can currently not be assessed for the EU and Europe as a whole. 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 per year, excluding major mineral wastes (mineral construction and demolition waste, other mineral waste, dredging spoils and soils). Although the indicator focuses mainly on non-mineral wastes, which represent approximately 35 % of the total waste generated in the EU, ‘it is considered to reflect the general trend in waste generation more accurately and in a more comparable way than the generated total including mineral wastes’ (Eurostat, 2016b). This exclusion enhances the quality of the indicator as the uncertainty over major mineral waste data and associated statistics (in particular construction and mining) is rather high, while for some waste streams (for example contaminated soils) the key aim is to remediate these waste streams rather than to count them as waste. The exclusion also 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.

Waste generation data by economic sector are published by Eurostat every 2 years. These are grouped for the purpose of the indicator in the following way: 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 data, especially for the water and waste sector, include secondary waste, i.e. material that is the output of waste treatment (secondary waste). Progress in the (pre-)treatment of waste may result in an increase in the indicator because waste is counted twice, as primary and as secondary waste (Eurostat, 2016b.).

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.

The data used in this indicator are based on reporting according to the EU Waste Statistics Regulation (EU, 2002). The first reporting year was 2004 and data quality has been improving since then. In particular, during the 2004-2008 period, many countries implemented methodological changes in their data collection, including allocation of wastes to sectors, reclassification from unspecific waste codes to more specific ones, and exclusion of by-products from waste reporting. In 2010, a major revision of the Waste Statistics Regulation took effect, enabling a more precise calculation of the waste category 'waste excluding major mineral wastes' and the separate identification of secondary wastes. For all these reasons, the indicator in this briefing uses 2010 as a base year instead of 2004 that was used in last year's briefing. It should be kept in mind that an analysis of trends that is based on three data points only (2010, 2012, 2014) is, nevertheless, rather uncertain.

Footnotes and references

[1] According to the methodology used across this series of briefings (that supports the monitoring of the 7th EAP), a change of less than 3 % in the indicator value from the base year to the year with the latest available data is considered insignificant and the trend is assessed as being relatively stable, i.e. neither improving nor deteriorating.

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Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

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European Environment Agency

Resource efficiency and low carbon economy

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
	EU	EEA		
Recycling of municipal waste			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 all Member States meeting 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

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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 the environmental impacts associated with waste management and create jobs. In this regard it is important to further increase the municipal waste recycling rates. The Waste Framework Directive sets a target of 50 % of municipal waste (specific types of household and similar wastes) to be prepared for reuse or recycled by 2020 in EU Member States.

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.

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 the 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 the environmental impacts associated with meeting this demand (AIRS_PO2.1, 2017).

Policy targets and progress

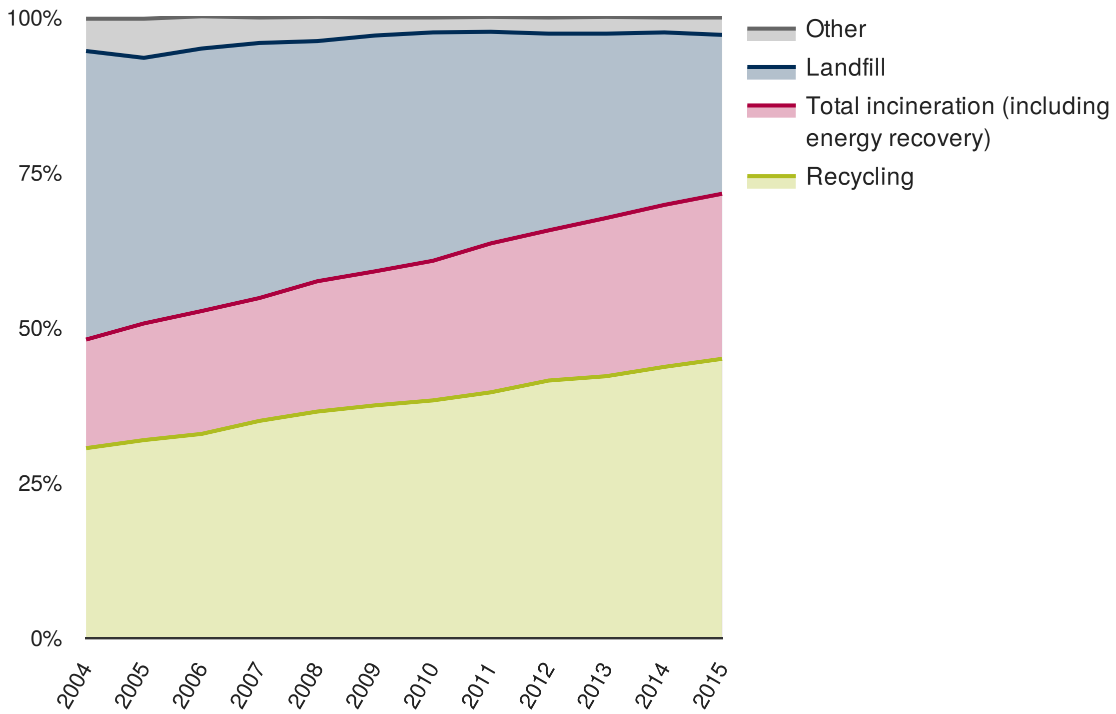
The EU has introduced multiple waste policies and targets since the 1990s. These include strategies, such as the Thematic Strategy on the Prevention and Recycling of Waste (EU, 2005), and framework legislation such as the Waste Framework Directive (EU, 2008). The Waste Framework Directive sets a target of 50 % of municipal waste to be prepared for reuse or recycled by 2020 in EU Member States, for at least four categories (i.e. paper, glass, metals, plastics) of waste. Countries can choose from four alternative calculation methods to measure progress towards the target (EU, 2011).

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: 60 % of municipal waste to be recycled and prepared for reuse by 2025 and 65 % by 2030. These targets are based on just one calculation method (similar to the one used in Figures 1 and 2 of this briefing), although some countries have the option of altering the timescale.

As can be seen in Figure 1, the overall rate of recycling (material recycling, composting and digestion) for the EU increased from 31 % in 2004 to 45 % in 2015. The increase was from 28 % to 40 % if data from non-EU, EEA member countries (Iceland, Liechtenstein, Norway, Switzerland and Turkey) is added to the aggregated EU country data. 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 (EEA, 2016a).

Around two thirds of the progress in enhanced recycling rates between 2004 and 2015 was primarily because of more material recycling. Increased composting and digestion was responsible for the remaining third (EEA calculation based on Eurostat, 2017a).

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



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

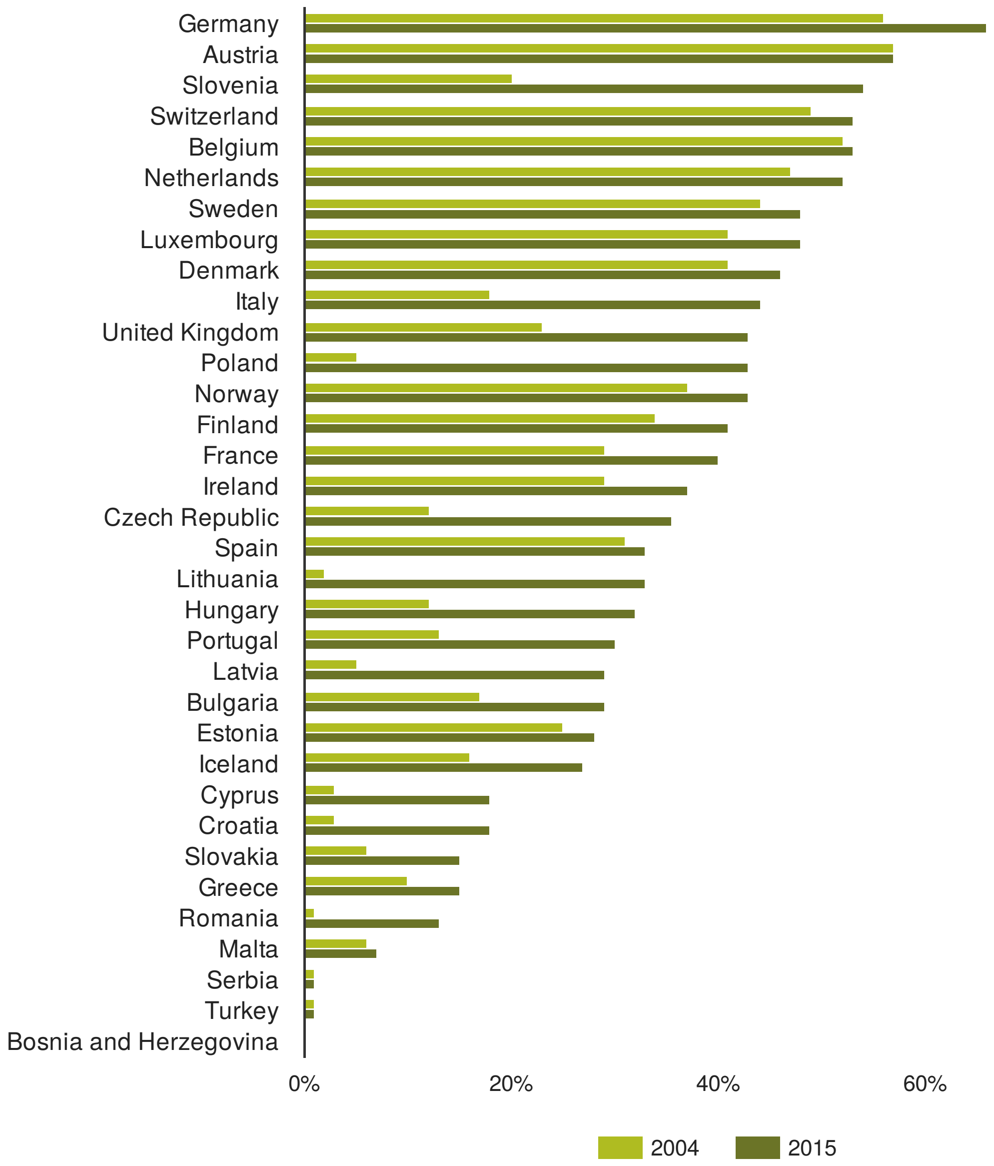
Note:
The treatment shares relate to waste generated. Recycling of municipal waste includes material recycling and composting/anaerobic digestion and might also include preparing for reuse. Data for 2004-2006 exclude Croatia. 'Other' includes, inter alia, mass losses during pre-treatment, storage and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

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 the share of incineration is also growing, with a 52 % increase between 2004 and 2015, compared with a 47 % 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, as shown in Figure 2, 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



Data sources: a. Eurostat. Municipal waste by waste operations
b. Ministry of the Environment of the Czech Republic. Waste Management Information System

Note: The recycling rate is calculated as the percentage of municipal waste generated that is recycled, composted and anaerobically digested, and might also include preparing for reuse. Changes in reporting methodology mean that 2015 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 2015 data, 2014 data were used for Portugal and 2012 data for Ireland. 2015 data for Cyprus, Germany, France, Luxembourg, Poland, Slovenia, Spain and Turkey are estimates. Turkish recycling data include only composting/anaerobic digestion.

There were large differences in performance among those countries with the highest and lowest recycling rates. Germany, Austria, Belgium, Switzerland, the Netherlands and Slovenia recycled at least half of their municipal waste in 2015. The highest increases in recycling rates between 2004 and 2015 occurred in Poland, Slovenia, Lithuania, Italy, Latvia, Czech Republic, United Kingdom and Hungary, ranging from 38 (Poland) to 20 (Hungary) percentage points. Overall, in 16 out of 32 countries, the increase in recycling rates was at least 10 percentage points during this period. However, in nine countries the proportion of recycled municipal waste barely changed. In Turkey, Malta, Austria, Belgium, Spain, Estonia, Sweden, Switzerland and the Netherlands the increase was fewer than 5 percentage points). Comparability of 2004 and 2015 data is limited for Austria, Cyprus, Malta, Slovakia and Spain because of methodological improvements in data collection.

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 (EU, 2011). Figure 2 shows recycling rates calculated following the most demanding method, i.e. recycled and composted/digested municipal waste as a share of total generated municipal waste.

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. 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 (such as pay-as-you-throw schemes) (EEA, 2016b). 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 objective:

- 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 2050 in the 7th EAP.

About the indicator

This indicator focuses on the recycling of municipal waste. Despite the fact that it represents only around 10 % (Eurostat, 2017b) of total waste generation in the EU, municipal waste is very visible and its reduction 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, for example whether or not the weight of material collected but discarded during the recycling process is included and how inputs and outputs of pre-treatment are allocated.

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).

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AIRS_PO2.1, 2017, Resource efficiency, European Environment Agency

> Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

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Resource efficiency and low carbon economy

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 the area in the EU that was affected by water stress reduced, hotspots for water stress conditions are likely to remain given continued pressures such as climate change, increasing population and urbanisation

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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

While freshwater is relatively abundant in the EU, 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 the EU, 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.

Overall, the EU area affected by water stress decreased over the period 2002 and 2014. A key reason behind this was a decrease in water abstraction as a result of efficiency gains in electricity cooling, agriculture and public water supply.

While efficiency gains in water abstraction are likely to persevere in the period to 2020, hotspots for water stress conditions are nevertheless likely to remain, given continued pressures such as climate change, increasing population and ongoing urbanisation. It therefore remains uncertain whether or not water stress can be prevented or significantly reduced by 2020 across the EU. It is indeed important that water abstraction respects available renewable resource limits in order to prevent or significantly reduce water stress.

Setting the scene

The 7th EAP aims to ensure that, by 2020, stress on renewable 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, industry and tourism, and it is an essential component for preserving biodiversity and maintaining other freshwater ecosystem services such as 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. For more information on WEI+ see the ‘About the indicator’ section of this briefing.

Policy targets and progress

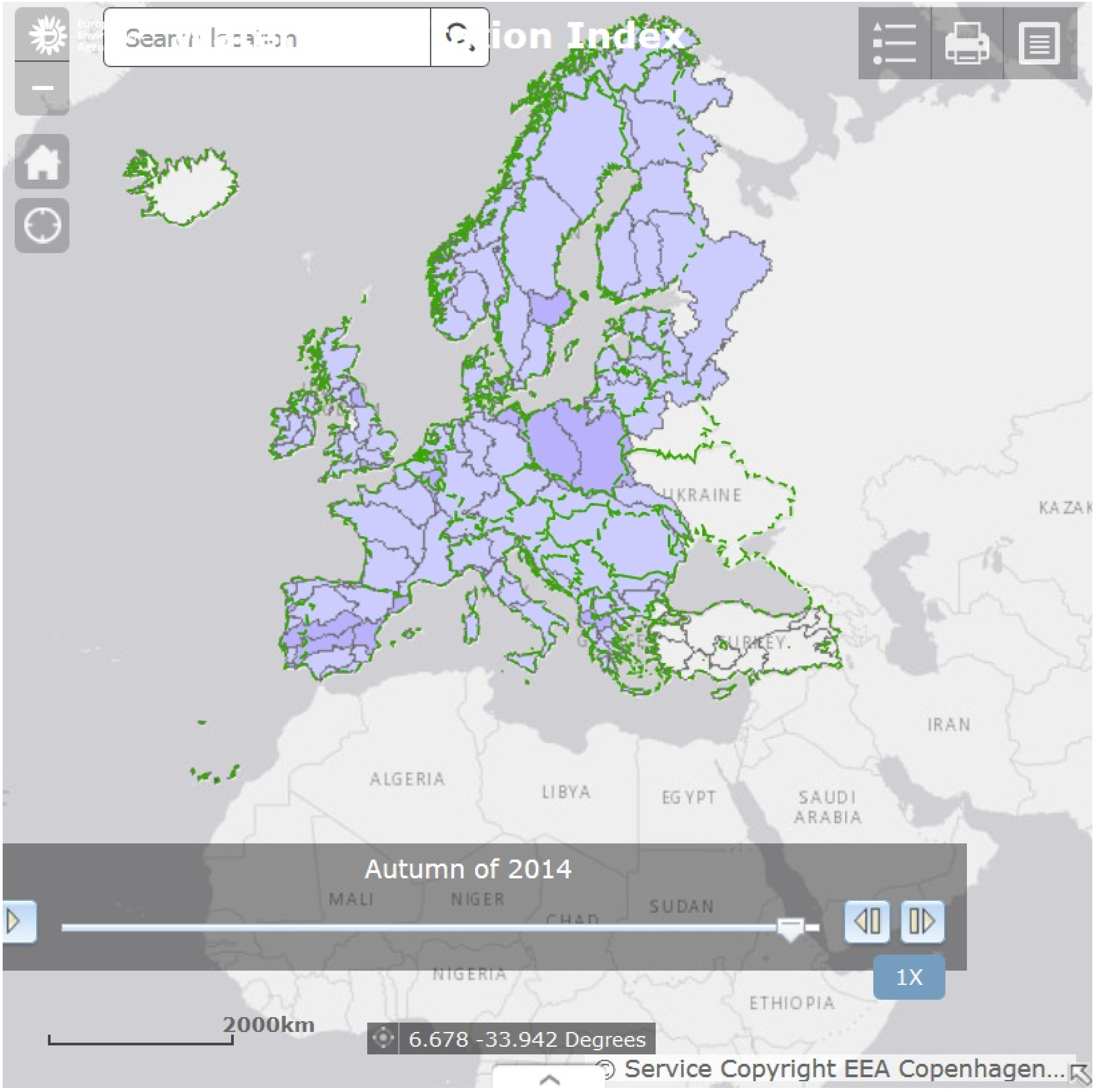
The EU’s Roadmap to a Resource Efficient Europe (EC, 2011) includes a milestone for 2020 that ‘water abstraction should stay below 20 % of available renewable freshwater resources’. As quantity and quality of water are closely linked, achieving ‘good’ status under the Water Framework Directive (see Surface waters briefing, AIRS_PO1.9, 2017) also requires ensuring that there is no overexploitation of water resources.

On average, over the 2002-2014 period, 12.1 % of the EU (and Iceland, Norway and Switzerland) territory was affected by water stress. Water stress decreased over this period. 12.7 % of the EU (plus Iceland, Norway and Switzerland) area was affected by water stress in 2002 and in 2014 the affected territory was 11 % (ETC ICM, 2017).

Water stress is driven by two important factors: (1) climate, which controls availability of renewable water resources and seasonality in water supply, and (2) water demand, which is largely driven by population density and related economic activities.

While freshwater is relatively abundant in the EU (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 in many parts of the EU, in particular in densely populated areas and the Mediterranean (Figure 1).

Figure 1. Water Exploitation Index plus for Europe, 2002 - 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

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. The highest WEI+ for the 2014 summer period was estimated for Spanish and Portuguese islands, Malta and Cyprus (81 %), where tourism and recreational activities put high pressure over the renewable water resources. At the river basin district scale, the highest WEI+ for the 2014 summer period were estimated in the Jarft river basin in Poland (67 %) and in the Segura river basin in Spain (62 %).

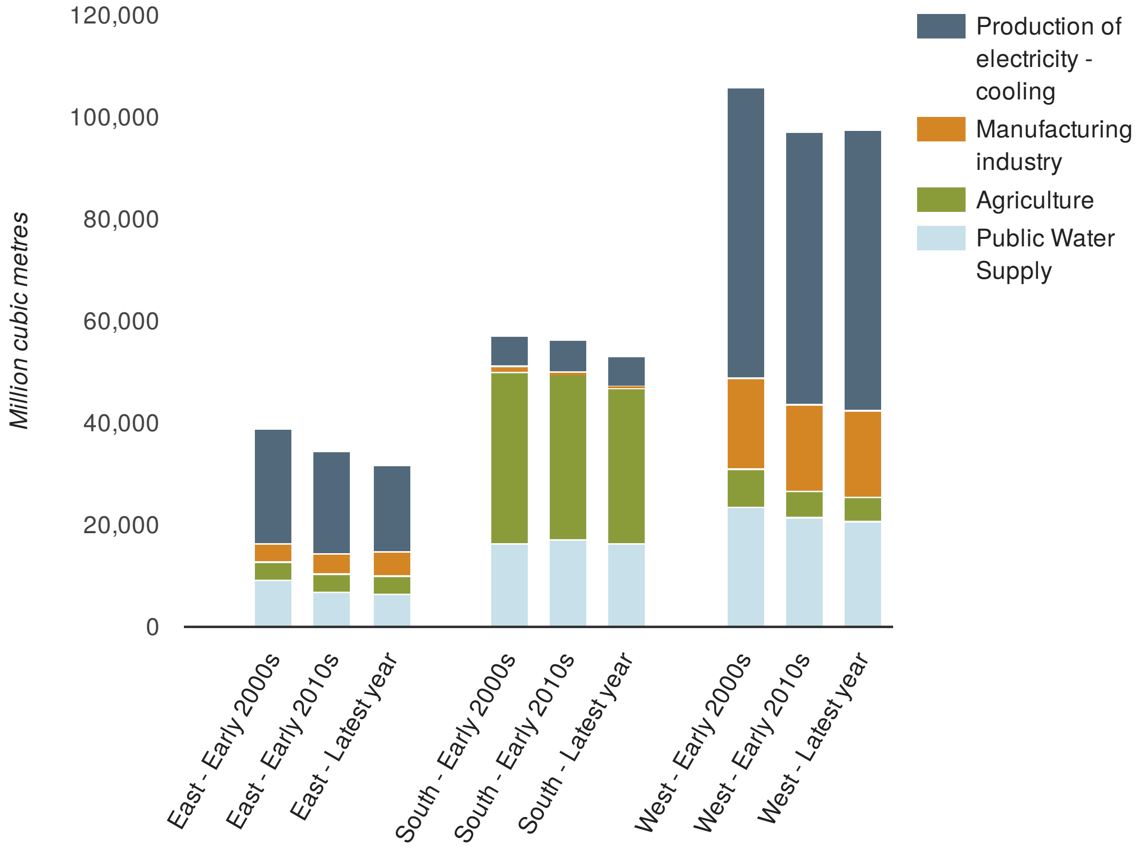
Rivers and groundwater aquifers supply more than 80 % of the total water used in Europe annually.

Around 17 river basin districts, mainly in Spain, Malta, Cyprus, Greece, Portugal, Poland and the United Kingdom experienced water stress conditions during the summer months in 2014. This was because of 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 groundwater 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.

Figure 2 looks in detail into water abstraction by sector. Sectorial demand on water abstraction varies among different regions in the EU. For instance, while agriculture is the main pressure on water resources in southern Europe, water abstraction for electricity cooling and public water supply are the main pressures in western Europe (Figure 2).

Figure 2. Water abstraction by sector, EU



Data sources: Eurostat. Annual freshwater abstraction by source and sector (env_wat_abs)

Note:
- East: Bulgaria, Czech Republic, Croatia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia
- South: Cyprus, Greece, Italy, Malta, Portugal, Spain
- West: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, United Kingdom

Data show the four main sectors.
Early 2000s, early 2010s and latest year were calculated as the averages of 1999-2001, 2009-2011 and 2013-2015 respectively with some limited gap filling (background data files can be obtained on demand).

Water abstraction decreased by approximately 9 % between the early 2000s (which is an average gap filled value for 1999-2001) and the latest available ‘year’ (which is an average gap filled value for 2013-2015); data availability by country and sector can be seen in WISE 3 (EEA, 2017a) and in Eurostat, 2017.

The decrease in water abstraction from the early 2000s and up to the latest available 'year' was mainly because of efficiency gains in electricity cooling, agriculture and public water supply. The decrease in water abstraction played a key role in the decrease in water stress observed over the period 2002 to 2014 (ETC ICM, 2017).

Looking towards 2020, while efficiency gains in water abstraction at sector level are likely to continue to improve in the period to 2020, hotspots for water stress conditions are likely to remain – primarily in Southern Europe as well as in a number of highly densely populated areas across Europe. This is because of ongoing and projected pressures from climate change – such as increasing droughts in several parts of Europe (EEA, 2017b) – increasing population and ongoing urbanisation. It therefore remains uncertain whether or not water stress can be prevented or significantly reduced across the EU. It is indeed important that water abstraction respects available renewable resource limits in order to prevent or significantly reduce water stress.

Outlook beyond 2020

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 several regions of Europe (EEA, 2017b). 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 (EEA, 2017b and ETC ICM, 2017).

If the area under water stress is to be reduced, additional improvements to water efficiency in all sectors will be needed. 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

The WEI+ indicator 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, 2017).

Data on water use have been derived from various sources such as WISE 3, EPRT-R (EEA, 2017c), UWWTPs (EEA. 2017d) and Eurostat water data (Eurostat, 2017), which have been integrated into the EEA water accounts production database.

For further information on the methodology of the WEI+ see EEA, 2017e and ETC ICM, 2017.

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AIRS_PO1.9, 2017, Surface waters, European Environment Agency

> Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

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Resource efficiency and low carbon economy

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 in greenhouse gas emissions and their future evolution as projected by the EU Member States indicate that the 2020 greenhouse gas emission reduction target will be met

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

The Seventh Environment Action Programme (7th EAP) supports the objective of reducing EU greenhouse gas emissions by 20 % (compared with 1990) by 2020.

Emission projections indicate that Europe should meet its 2020 greenhouse gas emission reduction target. There was a small (0.5%) increase in the 2015 greenhouse gas emissions compared with 2014. Despite this, total EU greenhouse gas emissions in 2015 were 22.1 % below 1990 levels, which is already below the 2020 target level. The main reasons for the reduction in greenhouse gas emissions from 1990 to 2015 are improved energy efficiency, switching to less carbon-intensive fuels, and an increase in the use of renewable energy sources. Structural changes in the economy, relatively mild weather conditions and reduced economic activity as a result of the 2008 economic downturn also played important roles in the reduction in greenhouse gas emissions over the 1990-2015 period. The increase in greenhouse gas emissions in 2015 compared with 2014 was triggered by higher heat demand from households and services as a result of slightly colder winter conditions in Europe, and by higher road transport demand. According to national projections aggregated at EU level, greenhouse gas emissions are expected to decrease further by 2020, and indeed preliminary 2016 results show a reduction in emissions of 0.7 % compared with 2015.

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. EU Member States expect that planned policies will result in reductions in EU emissions of 30-32 % below 1990 levels by 2030, falling short of the 40 % reduction target. However, it is as yet unclear to what extent these projections reflect the latest policy developments that are linked to the implementation of the recently endorsed 2030 target.

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 (EEA, 2016a).

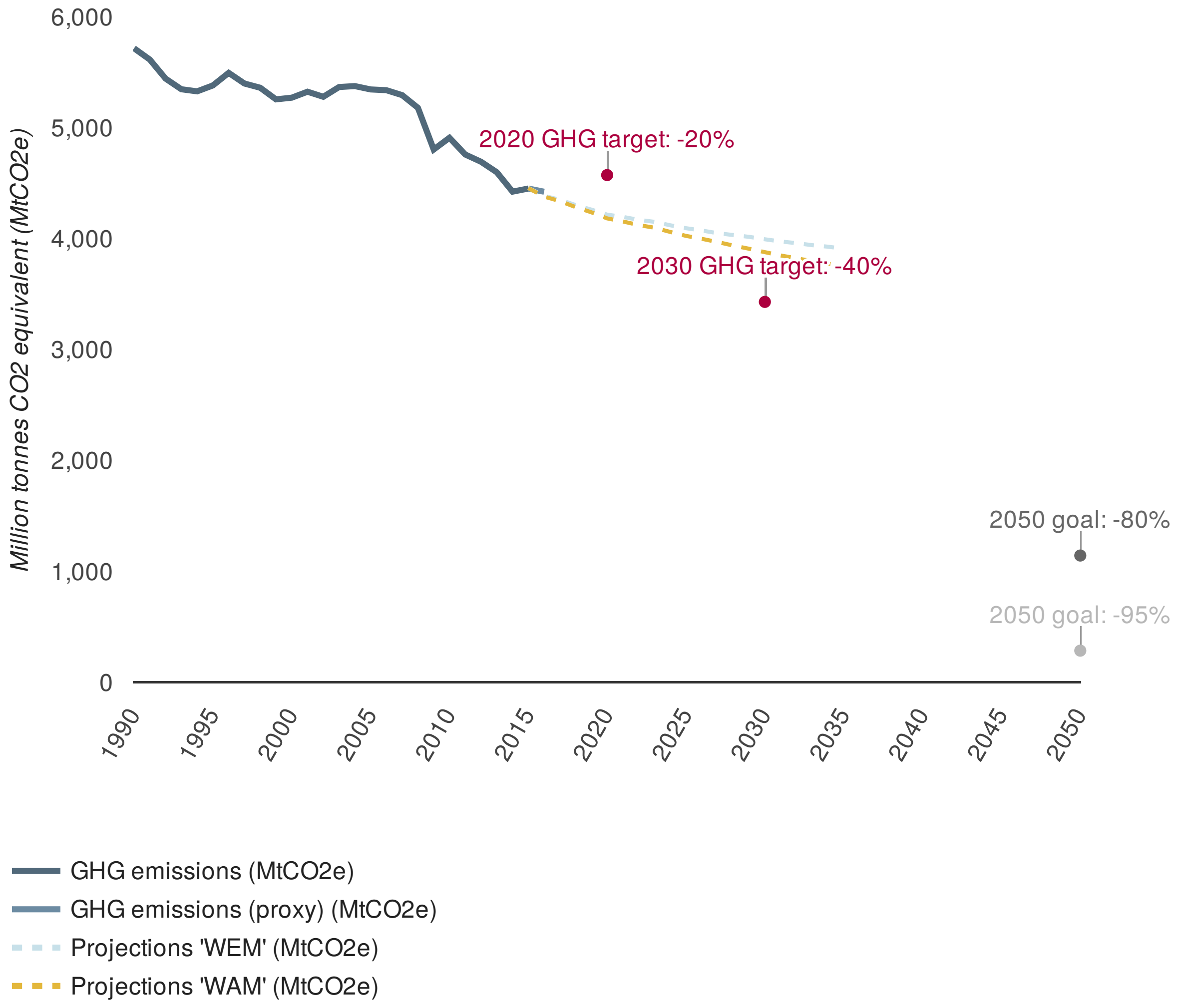
Policy targets and progress

The EU has committed to achieving a reduction in its greenhouse gas emissions of at least 20 % by 2020, compared with 1990 levels (EEA, 2016b). 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 emission reduction target is separated into one EU-wide target for large industrial installations, covered by the European Union Emissions Trading System (EU ETS) (EU, 2009a) and 28 binding national targets for all emissions not covered by the EU ETS. These national targets, set under the Effort Sharing Decision (ESD) (EU, 2009b), 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 9.3 % 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 a 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 these countries are also covered. In 2015, 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.



Data sources:

a: European Environment Agency (EEA) **National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism**

b: European Environment Agency (EEA) **Approximated greenhouse gas emissions**

c: European Environment Agency (EEA) **Greenhouse gas projections**

d: European Environment Agency (EEA) **EEA – Indicator CSI 010**

Notes:

1. The 2016 data are preliminary estimates.
2. EU targets and goals are expressed against 1990 levels.
3. Projections 'WEM' are projections 'with existing measures'.
4. Projections 'WAM' are projections 'with additional measures'.

In 2015, EU greenhouse gas emissions were already 22.1 % below 1990 levels (see Figure 1). Greenhouse gas emissions for 2015 increased by 0.5 % compared with 2014 mainly as a result of higher heat demand from households and services, owing to the slightly colder winter conditions in Europe, and because of higher road transport demand, which increased for the second year in a row. In 2015 compared with 2014 the greenhouse gas emissions from the ETS sectors decreased by 0.7 %, whereas emissions from non-ETS sectors - and the household, services and transport are amongst the non-ETS sectors - increased by 1.4 %.

The EU improved its energy intensity over the 1990-2015 period examined. This was because of energy efficiency improvements and structural changes in the economy, as well as reduced energy consumption as a result of the 2008 economic downturn (for more information, see the Energy efficiency briefing (AIRS_PO2.7, 2017). Reductions in greenhouse gas emissions can also be explained by changes in the mix of fossil fuels used - more gas and less coal - as well as by the increasing use of renewable energy sources (RES) (for more information, see the Renewable energies briefing (AIRS_PO2.9, 2017). These changes reflect 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, 2015). Demand for energy to heat households was also lower during this period, as Europe has experienced milder winters on average since 1990 (EEA, 2016c).

Preliminary estimates of greenhouse gas emissions for 2016 indicate an overall decrease of 0.7 % compared with emissions in 2015 (EEA, 2017a); the 2016 emissions from the transport and the residential and commercial sectors (two important non-ETS sectors) are nevertheless expected to increase their emissions compared with 2015 (EEA, 2017b).

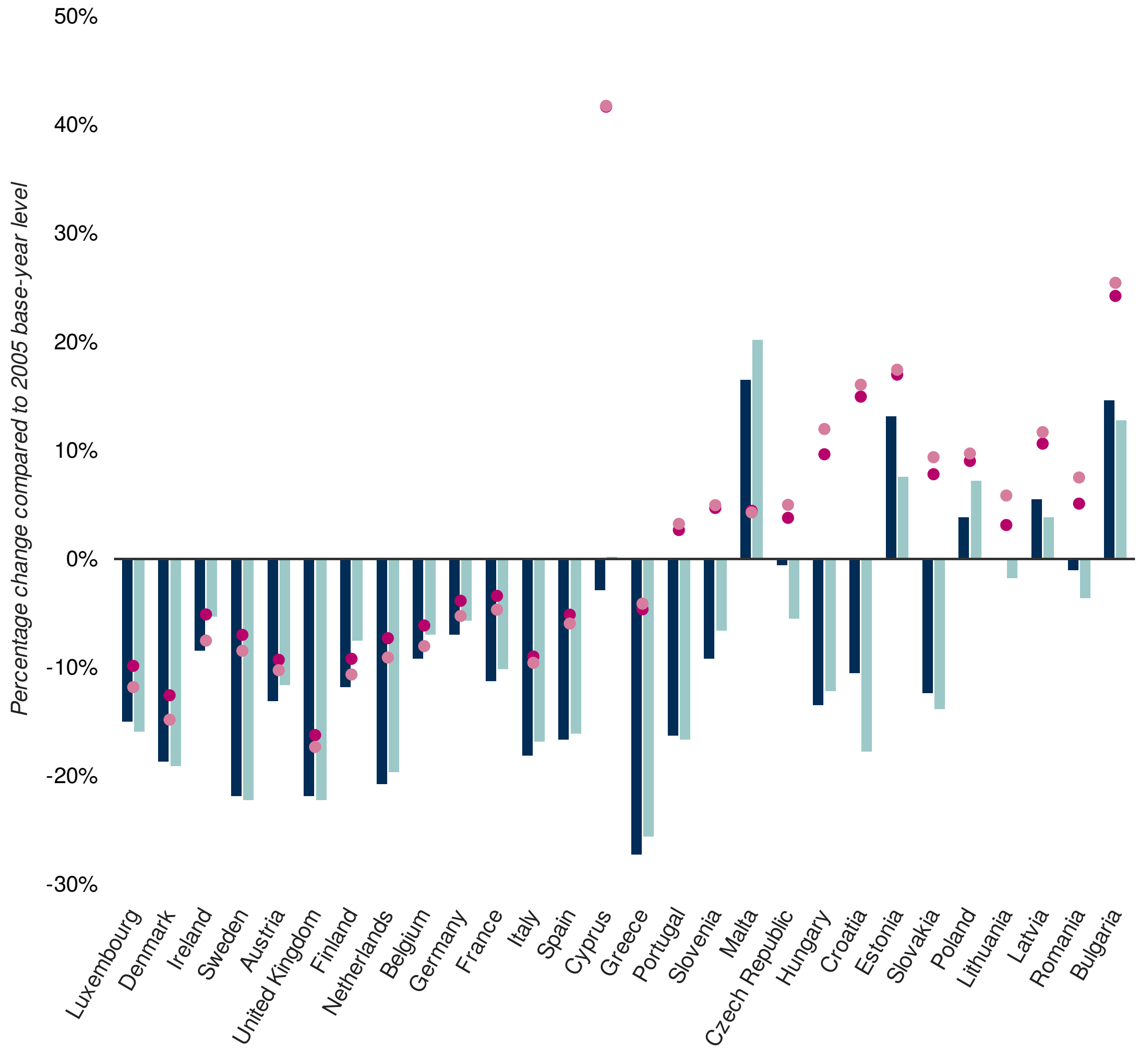
Greenhouse gas emissions for the EU - aggregated from the EU Member State reported projections - are expected to decrease further to 26 % by 2020 with the current measures that are already in place. Additional measures (currently planned by Member States) could further reduce emissions to 27 % below 1990 levels. Most of the savings in greenhouse gas emissions are expected to take place within the EU ETS sectors (EEA, 2017b).

Country level information

To meet the 2020 greenhouse gas emission target, the EU adopted a climate and energy package in 2009, comprising a legislative set of binding targets that 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. Over the 2005–2015 period, the ETS sectors saw reductions in emissions of approximately 24 %. Reductions in emissions from combustion installations, which represent more than 70 % of all ETS emissions and are dominated by electricity generation, occurred largely as a result of changes in the fuel mix 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 in the same period. The reduction in emissions was also due to improvements in transformation efficiency for electricity generation, which means that less primary energy was necessary to generate the same electricity. The cement, lime and iron and steel sector, another key contributor of greenhouse gas emissions within the ETS, followed similar emission trends to the combustion installations and decreased its emissions, to a large extent, because of reduced production as a result of the 2008 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 2015, 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: European Environment Agency (EEA) Approximated greenhouse gas emissions

b: European Commission Verified emissions under the EU ETS

c: European Environment Agency (EEA) Effort Sharing Decision (ESD)

d: European Commission Commission Decision 2013/162/EU

e: European Commission Commission Implementing Decision 2013/634/EU

The national emission 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 Member States' ESD emissions for each year with the annual national targets. In 2015, all Member States but one (Malta) were below their national ESD targets. According to preliminary estimates for 2016, four Member States (Belgium, Finland, Ireland and Malta) had exhibited ESD emissions higher than their national targets (Figure 2).

National projections show that, in most Member States, ESD emissions will remain below annual ESD targets until 2020. However, in seven Member States (Austria, Belgium, Finland, Germany, Malta, 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, the European Council adopted, in 2014, a new set of climate and energy targets for 2030 (EC, 2014). This includes a binding target of reducing GHG 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 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 30 % by 2030, compared with 1990 levels, and the implementation of additional measures could increase this reduction to 32 %. However, it is not yet clear to what extent these projections reflect the latest policy developments, such as the revisions and consequent strengthening of the renewable energies and of the energy efficiency Directives, to the implementation of the 2030 GHG emissions target (EEA, 2017a).

About the indicator

This indicator presents past and future trends for anthropogenic greenhouse gas emissions in Europe. In line with the United Nations Framework Convention on Climate Change and the 2006 Intergovernmental Panel on Climate Change (IPCC) guidelines, the indicator covers the following greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. 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 national GHG totals include indirect CO2, when reported by the countries, as well as emissions from international aviation, whereas they exclude emissions or removals from land use, land-use change and forestry 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.

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Annual Indicator Report Series (AIRS)

Briefings

AIRS_PO2.7, 2017, Energy efficiency, European Environment Agency

AIRS_PO2.9, 2017, Renewable energies, European Environment Agency

> Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

Published on 30 Nov 2017

Resource efficiency and low carbon economy

Renewable energy sources

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 progress is maintained, the 2020 renewable energy target will be met

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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. Thanks to dedicated national support schemes and significant cost reductions achieved by some renewable energy technologies, the EU increased steadily the contribution of renewable energy sources to gross final energy consumption over the 2005-2015 period examined. In 2015 the share of renewable energy sources in the EU's gross final energy consumption reached 16.7 %. However, the pace of progress decreased slightly in 2015 compared with 2014 due to an increase in 2015 of the gross final energy consumption. 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. Nevertheless, in the early 2010s changes to support mechanisms for renewables, in particular cuts in feed-in tariffs in some Member States, that were even applied retroactively, led to uncertainty on the market and may have caused some investors to hold back. EEA preliminary estimates for 2016 show an increase in the share of renewable energy sources in gross final energy consumption, but also a slight slowing down of the pace of progress, compared with 2015. More action may be necessary to ensure that the EU remains on target.

Setting the scene

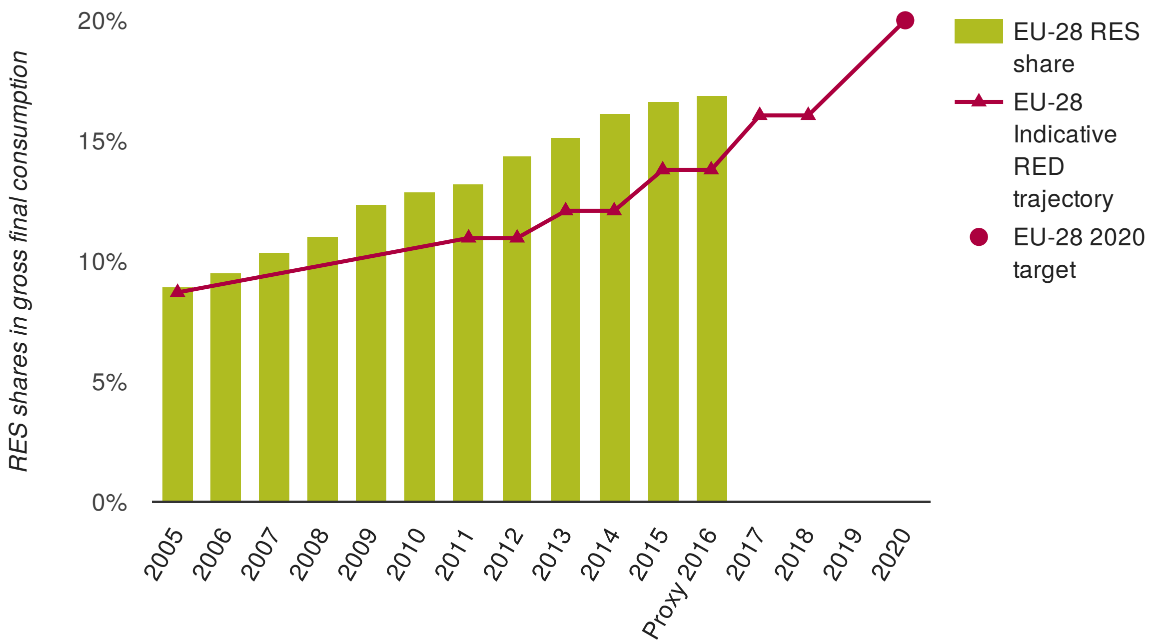
The 7th EAP (EU, 2013) supports the EU's objective of meeting its 2020 renewable energy target (EU, 2009). In comparison with fossil fuels, using renewable energy results in reduced greenhouse gas and air pollutant emissions, reduced environmental and health impacts, and a reduced dependency on energy 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 sources (RES) in gross final energy consumption, EU



Data sources: a. European Commission. Indicative trajectories for the share of energy from renewable sources in gross final consumption of energy, from national renewable energy action plans (NREAPs)
b. Eurostat. SHARES Results 2014 (nrg_ind_335a) c. EEA – Indicator ENER028

As can be seen in Figure 1, the proportion of renewable energy in gross final energy consumption increased continuously between 2005 and 2015 to reach 16.7 % in 2015. The increase over the examined period has been more rapid than the target path prescribed by the Renewable Energy Directive, thus putting the EU well on the path to meet its 2020 target. 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 (EEA, 2016a).

Shrinking production costs due to the scaling up of global production volumes and technological advances have also played an important role (IRENA, 2016a; EC, 2015a). 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 (Frankfurt School-UNEP Centre/BNEF, 2014). Electricity from onshore wind turbines became 15 % cheaper during the same period (Frankfurt School-UNEP Centre/BNEF, 2014).

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, 2016b). Wind power, solar electricity and biofuels for transport are expected to grow fastest up to 2020 (EEA, 2017b). This was also the case during the 2005–2015 period, not least because these technologies started from a low initial level. In absolute terms, however, hydropower and biomass (for heat generation) could remain the most important single RES up to 2020, despite a decrease in their contribution to the overall energy produced by renewable sources (EEA, 2017b). In 2015, hydropower accounted for 16 %, and biomass for 59 %, of final renewable energy consumption.

In terms of installed and connected renewable electricity capacity, the EU was second to China in 2015. With respect to new renewable electricity installed capacity, the EU has been gradually losing ground in recent years to non-European markets, such as China, Japan and the United States (EEA, 2017b). The EU was the region with the highest investment in renewable energy projects every year from 2005 to 2012, but has been surpassed by China since 2013 (Frankfurt School-UNEP Centre/BNEF, 2016). This highlights Europe's pioneering role in developing renewable energy. However, since 2013 European investment in renewables has decreased, for example, in 2015 it decreased by 8 % compared with the previous year (Frankfurt School-UNEP Centre/BNEF, 2017). This reflected not only lower investment costs due to the reduction of production costs, as explained above, but also a slow down by some Member States that have already met or almost met their 2020 targets and some uncertainty surrounding the future of support mechanisms (Frankfurt School-UNEP Centre/BNEF, 2014). Regarding the latter, in the early 2010s, cuts in feed-in tariffs in some Member States were applied retroactively (i.e. to existing plants) and the switch from feed-in-tariffs to auction schemes led to uncertainty on the market, which may have caused some investors to hold back (EC, 2015a).

Over the period 2005 – 2014, the share of renewable energy sources in the EU's gross final energy consumption increased, on average, by 6.5 % annually. In 2015, this growth rate slightly decreased to 6.4 %, allowing the EU to reach a 16.7 % share of renewables in final energy consumption. Preliminary EEA estimates for 2016 show that the share of renewable energy sources in the EU's gross final energy consumption will be circa 16.9 % (EEA, 2017a). This corresponds to a further slight deterioration of the growth rate of the share of renewable energies in the gross final energy consumption in 2016 – to 5.9 %. The slightly lower pace of growth is due to the increase in EU final energy consumption from all sources in 2015 and 2016, compared with 2014 (AIRS_PO2.7, 2017). The increase in energy consumption moderated the increase in the share of renewable energy consumption because if final energy consumption is higher, a higher overall quantity of energy is required from renewable energy sources to meet the target.

Additional action from Member States may be required to ensure that the EU remains on the path to the 2020 target.

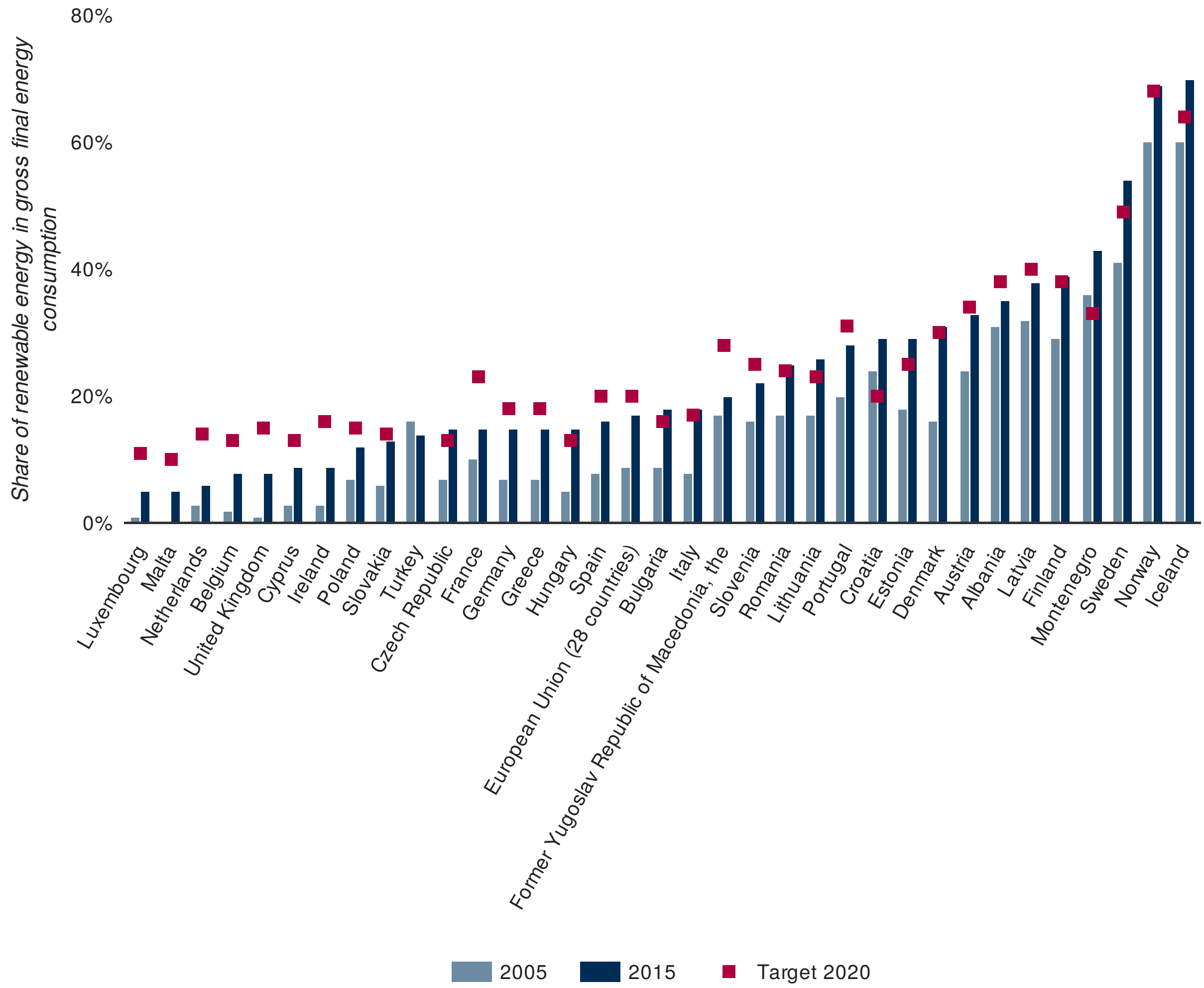
A number of European governments have introduced measures such as premiums on spot market prices, competitive tenders or capacity-dependent feed-in tariffs to help protect and increase the market penetration of renewable energy operators (EC, 2015a).

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.

Furthermore, in 2016, the European Commission proposed a set of Directives and Regulations in order to support the expansion of renewable energy sources; notably a recast of the Renewable Energy Directive (EC, 2016a) and several proposals for energy market design. Although the main focus and effects of these proposals will be felt post 2020, if adopted they will also enhance investor predictability prior to 2020 and they will help keep the momentum towards expanding renewable energy sources and therefore meeting the 2020 renewable energy target. For further information on these proposals please see the section ‘Outlook beyond 2020’.

Country level information

Figure 2. Share of renewable energy sources (RES) in gross final energy consumption, by country



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 2015, 14 EU countries at least doubled their renewable energy shares and Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, Hungary, Italy, Lithuania, Romania and Sweden, as well as Iceland and Norway, have already reached their targets for 2020[1].

The countries that are the furthest from their targets are France, Ireland, Luxembourg, the Netherlands and the United Kingdom (EEA, 2017c). 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 (EU Council, 2014).

Challenges for further progress in renewable energy are multiple. For instance, a key challenge is to arrive at a more unified and comprehensive European market design for energy – one that is able to maximise the use of intermittent renewable energy sources through cross-border interconnections, energy storage, wholesale trading and a flexible consumer demand – that lowers our need to invest in back-up power plants for meeting peak demands. Specifically in the case of biomass, there is a need to source and use this renewable energy source sustainably.

The Energy Union strategy (EC, 2015b) aims to ensure a secure, sustainable and affordable energy supply for all EU citizens and includes a number of energy and greenhouse gas emission targets for 2020, 2030 and 2050. The expansion of renewable energy sources is a key element of the strategy. More specifically, in order to overcome the expansion challenges of renewable energy and to meet the new EU 2030 renewables target, the European Commission proposed in 2016 a series of legislative measures. In particular, the Commission proposed a recast of the Renewable Energy Directive (EC, 2016a) and a new Regulation on the internal market for electricity (EC, 2016b). Both proposals aim to increase investment certainty for private operators, provide a more level playing field for energy technologies for the deployment of renewables and grant consumers a greater role in the development of renewable energy sources. The Renewable Energy Directive recast proposal also includes new sustainability criteria for bioenergy. In addition, the Commission proposed an Energy Union Governance Regulation (EC, 2016c) that requires Member States to prepare integrated national energy and climate plans that set out individual national climate, energy efficiency and renewable energy contributions by 2030 in order to reach the targets of the Energy Union Strategy. These proposals are currently being discussed by the European Parliament and the Council. It is expected that they will be adopted by the end of 2017.

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.

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[1] For some of these countries (in particular Croatia and Hungary), the achievement of the target is a direct consequence of solid biomass data revisions.

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Resource efficiency and low carbon economy

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	

Primary energy consumption decreased between 2005 and 2015. However, energy consumption increased in 2015 compared with 2014 and preliminary estimates indicate that it will increase also in 2016. Greater efforts are needed to keep the EU on track to meet its energy efficiency target.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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 decreased over the 2005-2015 period examined. Together with progress in implementing energy efficiency policies, improvements in the efficiency of energy transformation, structural changes towards less energy intensive industries and the economic downturn of 2008 have contributed to this development. In 2015, primary energy consumption in the EU increased by 1.4 % compared with 2014 primarily due to a slightly colder winter and increased energy demand in the transport sector. In 2015, the EU was nevertheless still on track to reach the 2020 target when compared with the indicative linear trajectory between 2005 and 2020. The EEA preliminary estimates for 2016 indicate that the EU primary energy consumption increased by 1 % compared with 2015. This means that Member States need to step up their efforts to keep the EU on track towards the 2020 target.

Setting the scene

The 7th EAP requires that the EU meet its 2020 climate and energy targets (EU, 2013). This briefing addresses the issue of energy efficiency, with greenhouse gas emissions (AIRS_PO2.5, 2017) and renewables (AIRS_PO2.6, 2017) 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.

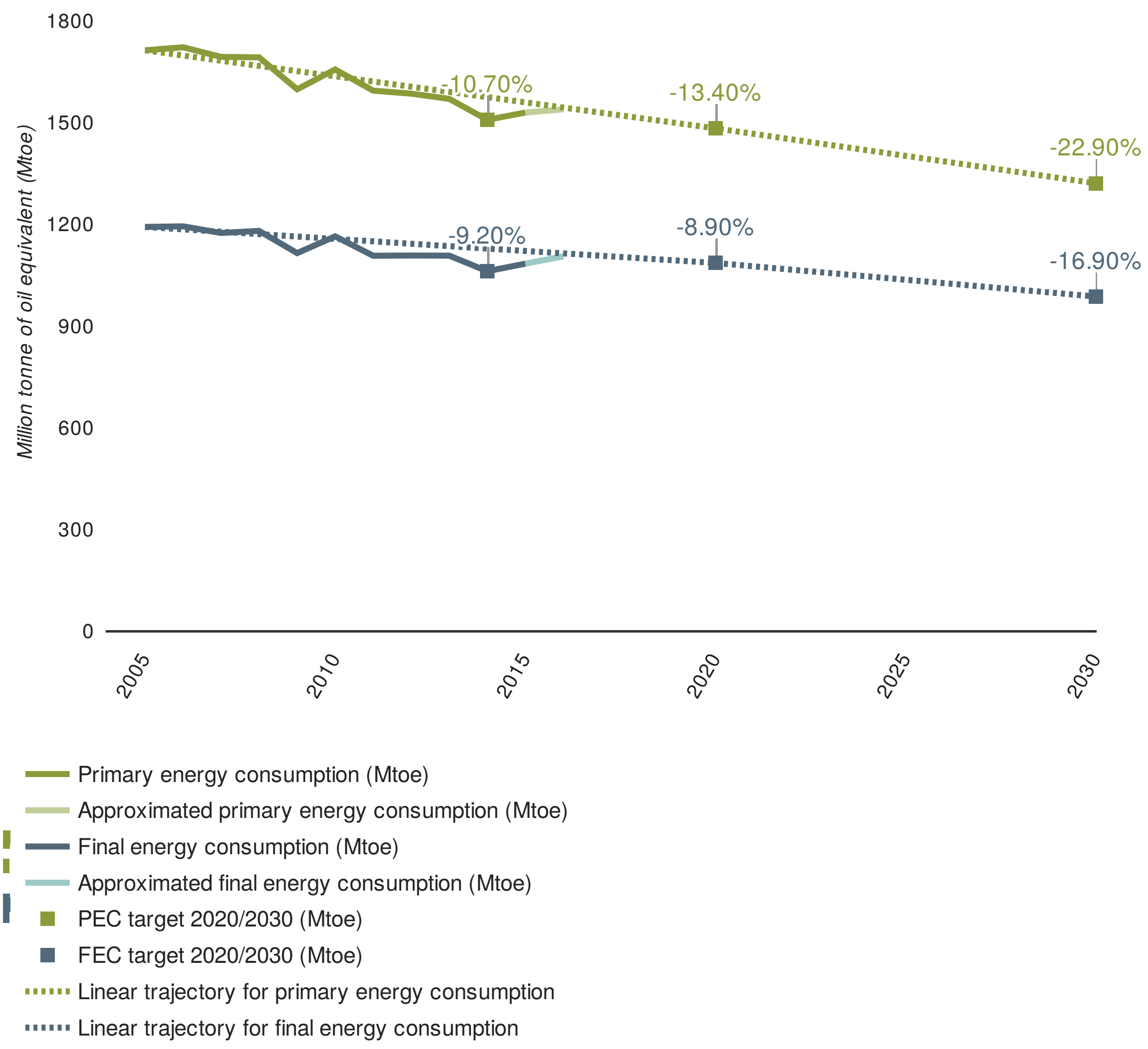
Policy targets and progress

The Energy Efficiency Directive (EED) (EU, 2012) includes the target that energy efficiency should increase by 20 % by 2020 compared with a business-as-usual scenario (EC, 2011)[1].

The EED translates this into two separate 2020 energy consumption reduction targets for the EU: 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. Primary energy consumption covers the consumption of the energy sector itself, losses during the transformation and distribution of energy and final energy consumption. Final energy consumption covers the consumption of end users (e.g. households, industry, services, agriculture) once the energy has been delivered to them. This briefing focuses on the 2020 primary energy consumption target as primary energy consumption encompasses final energy consumption.

In 2015, primary energy consumption in the EU reached 1 530 Mtoe, an increase of 1.4 % compared with 2014, primarily on account of a slightly colder winter and increased energy demand in the transport sector. Despite this increase, the EU remained below the linear trajectory towards the 2020 target.

Figure 1. Primary and final energy consumption including targets for 2020 and 2030, EU



Data source: a: Eurostat. **Primary Energy Consumption (t2020_33)**
b: European Commission. **Final energy consumption by sector**
c: European Commission. **Directive 2012/27/EU**
d: European Commission.**Energy Efficiency - 2030 Targets**
e: European Environment Agency (EEA). **Approximated primary energy consumption**
f: European Commission. **Indicative trajectories for the share of energy from renewable sources in gross final consumption of energy, from national renewable energy action plans (NREAPs)**
g: European Environment Agency (EEA). **Approximated final energy consumption**

Note: The Primary Energy Consumption (PEC) and Final Energy Consumption (FEC) numbers shown for 2020 and 2030 represent the EU targets compared with 2005.

The reduction in the EU primary energy consumption over the 2005-2015 period was mainly the result of improved efficiency in the conversion of primary energy sources (e.g. coal and gas) into final energy, changes in the fuel mix used to produce electricity and heat (higher penetration of renewable and gas energy) and decreases in final energy consumption.

In 2015, final energy consumption in the EU was 9 % lower than in 2005. The main drivers of this decrease were the implementation of energy efficiency policies, structural changes towards less energy-intensive industrial sectors and the 2008 economic downturn. The biggest contributors to the final energy consumption decrease were the industrial and household sectors that together are responsible for approximately 80 % of the decrease (Eurostat, 2017).

In the run-up to 2020, a number of policies and measures adopted at EU level are expected to contribute towards the 20 % reduction target, in addition to the EED.

These include:

- The Energy Performance of Buildings Directive (EU, 2010a),[2]
- Product regulations laying down minimum energy performance standards and requirements for energy labelling (the Ecodesign Directive (EU, 2009a) and the Labelling Directive (EU, 2010b),
- CO_2 performance standards for cars and vans (EU, 2009b, 2011),
- 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 (EU, 2009c, 2009d).

Almost half of the effort needed to reach the 2020 target at EU level should come from measures implemented under Article 7 of the EED, which require Member States to demand energy companies to achieve yearly energy savings of 1.5 % of annual sales to final consumers, either by setting up an energy efficiency obligation scheme or by adopting alternative measures[3]. A recent assessment (Ricardo Energy and Environment et al., 2016) suggests that despite the fact that 27 Member States intend to make use of the exemptions allowed under the EED, the sum of the reported estimated savings is 9 % higher than the Article 7 targets, opening the possibility that the notified targets are met with the currently-reported national measures.

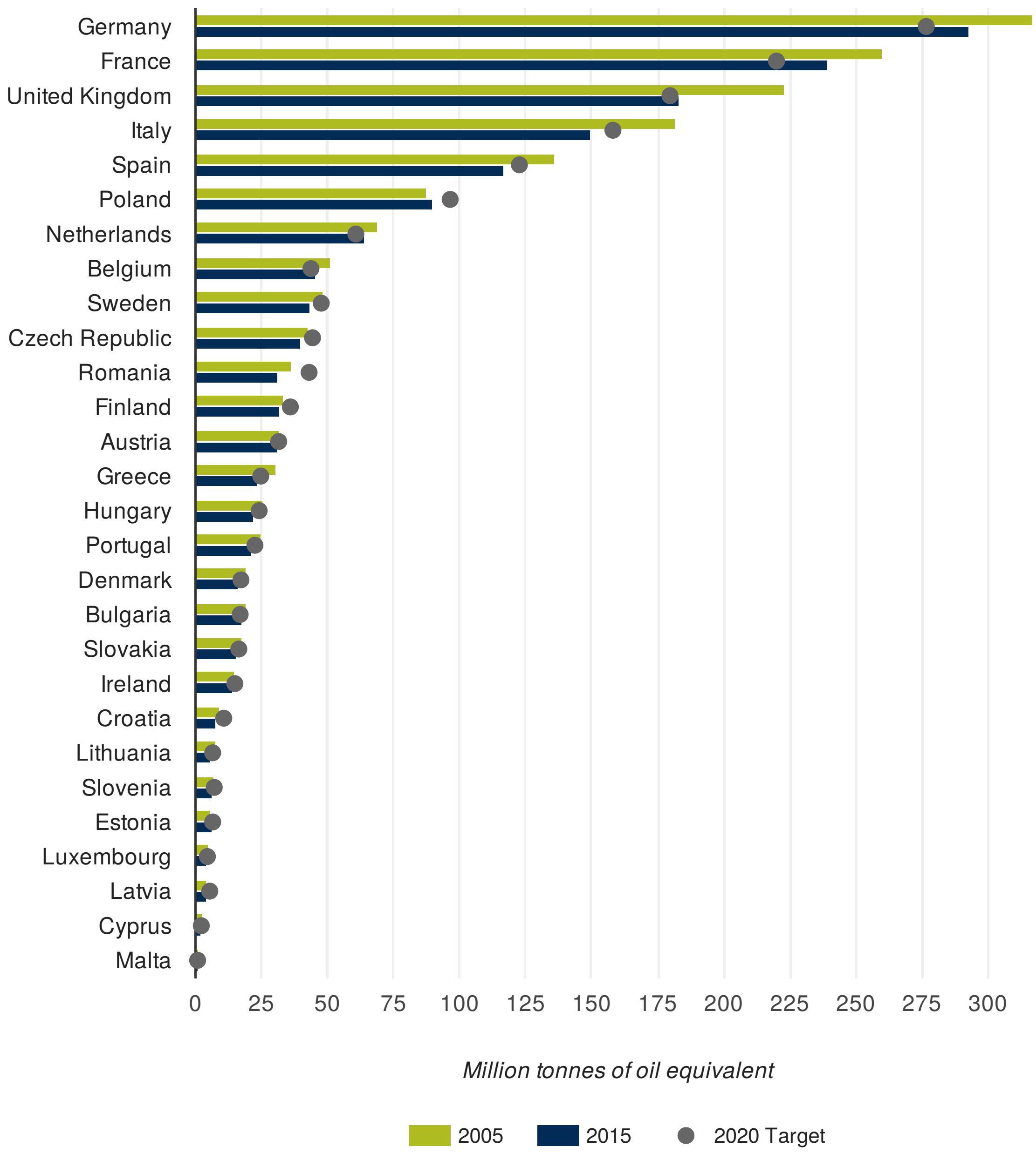
The energy efficiency targets set under the EED should also help to keep the momentum towards increasing energy efficiency. Taken together, the sum of the 2020 national targets for primary energy consumption reported by Member States in 2017 amounted to 1 540 Mtoe, which is 4 %

higher than the EU target (1 483 Mtoe) (EEA, 2017a).

However, in addition to the increase observed in the primary energy consumption in 2015 compared with the 2014 levels, EEA preliminary estimates indicate an increase in 2016 of 1 % compared with 2015 consumption levels (EEA, 2017a, 2017b, 2017c). More efforts are necessary to implement energy efficiency policies at the national level to ensure that the 2020 target is met (EEA, 2017a).

Country level information

Figure 2. Primary energy consumption and estimated targets for 2020, by country



Data sources: a. European Commission. Indicative trajectories for the share of energy from renewable sources in gross final consumption of energy, from national renewable energy action plans (NREAPs)

b. Eurostat. Primary Energy Consumption (t2020_33)

c. European Commission. Member states progress towards indicative national energy efficiency targets for 2020

d. European Commission. Energy Efficiency - 2030 Targets

e. EEA. Approximated estimates for the primary and final consumption of energy in 2016 (EEA 2016 proxies on primary and final energy consumption)

In 2015, 23 Member States reduced or limited their increase in primary energy consumption below the indicative linear trajectories drawn between 2005 levels and the 2020 targets. Five Member States (Bulgaria, Estonia, France, Germany and the Netherlands) had not achieved sufficient savings in primary energy consumption. According to preliminary EEA estimates, in 2016 three additional countries (Austria, Belgium and Cyprus) will have to reduce energy consumption rather fast in the coming years to reach their 2020 targets, while Estonia seems to have reduced primary energy consumption below the linear trajectory to 2020 (EEA, 2017a).

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 PRIMES baseline scenario (EC, 2014). In November 2016 the European Commission proposed an amended energy efficiency directive that includes an EU binding target of 30 % by 2030 (EC, 2016a) as well as an amended directive on energy performance of buildings (EC, 2016b) that enables the adaptation of the building sector to smart technologies; a new finance initiative for smart buildings will be launched to support the process of modernisation of buildings.

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] In 2016, the European Commission proposed a revised Energy Efficiency Directive (EC, 2016a) in order to align the energy efficiency targets with the EU 2030 climate and energy framework, to extend beyond 2020 the energy saving obligation and to improve metering and billing of energy consumption for heating and cooling consumers.

[2] The European Commission proposed in 2016 a revised Energy Performance of Buildings Directive (EC, 2016b). The proposed directive encourages the use of ICT (Information and Communications Technology) and modern technologies, including building automation and charging infrastructure for electric vehicles, to ensure buildings operate efficiently, streamline or delete provisions that did not deliver the expected output and strengthen the links between achieving higher renovation rates, funding and energy performance certificates as well as by reinforcing provisions on national long-term building renovation strategies, with a view to decarbonising the building stock by mid-century.

[3] Measures that can be counted under Article 7 as alternative measures include: energy or CO_2 taxes, financial incentives that lead to an increased use of energy efficient technology, regulations or voluntary agreements that lead to the increased use of energy efficient technology, energy labelling schemes beyond those that are already mandatory under EU law, training and education, including energy advisory programmes.

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. (https://ec.europa.eu/energy/sites/ener/files/documents/sec_2011_0779_impact_assessment.pdf) accessed 6 April 2017.

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EEA, 2017c, forthcoming, 'Final energy consumption by sector (CSI 027/ENER 016)', European Environment Agency.

EU, 2009a, 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, 2009b, 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 6 April 2017.

EU, 2009c, Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (OJ L 140/63, 5.6.2009).

EU, 2009d, Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (OJ L 140, 5.6.2009, p. 1 - 13).

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, 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 6 April 2017.

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).

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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).

Eurostat, 2017, 'Final energy consumption by sector' (http://ec.europa.eu/eurostat/web/products-datasets/-/tsdpc320) accessed 24 November 2017.

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Published on 30 Nov 2017

Resource efficiency and low carbon economy

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 in the period examined (2005-2015). Policies already 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

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

The Seventh Environment Action Programme (7th EAP) includes the objective that the environmental impact of housing should be reduced. Energy consumption in the use phase of housing causes the largest environmental impacts. Overall, the energy consumption of households in the EU declined by 11 % over the 2005-2015 period examined. This shows that policies on the energy performance of buildings and appliances are having an effect. Nevertheless, 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 of households. There was an increase of 4 % in 2015, compared with 2014, mainly because the 2015 winter was slightly colder. 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 of households.

Setting the scene

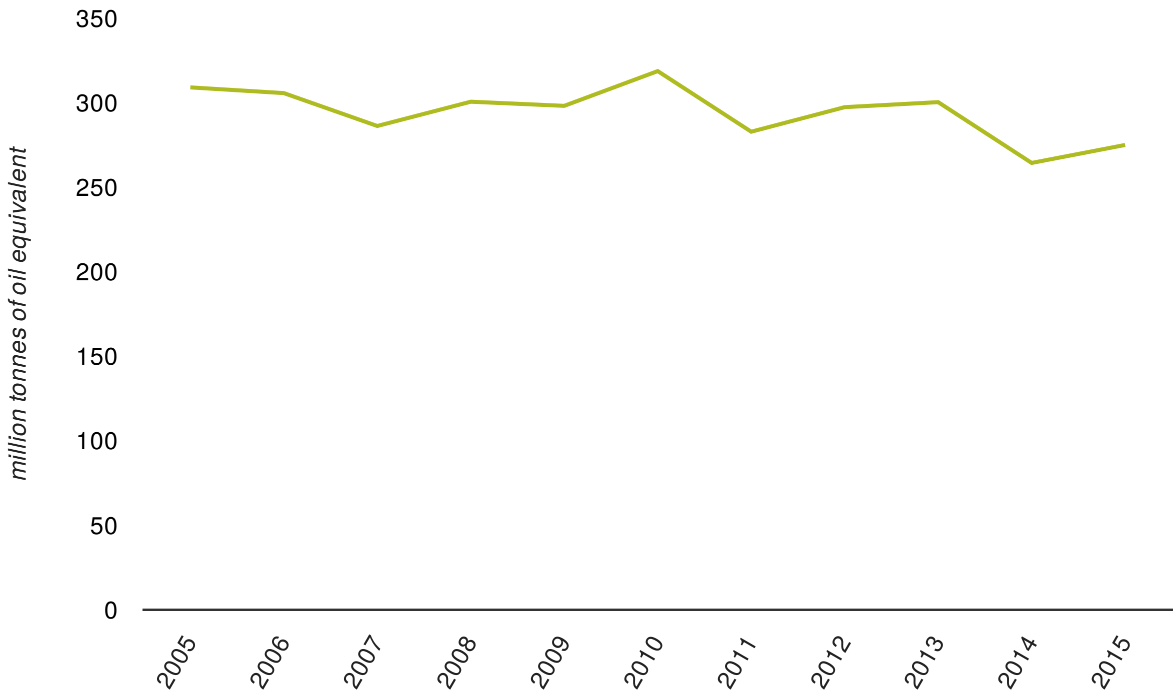
The 7th EAP calls for 'structural changes in production, technology and innovation as well as consumption patterns and lifestyles to reduce the environmental impact of production and consumption in the food, housing and mobility sectors' (EU, 2013). This briefing focuses on housing aspects, while food (AIRS_PO2.10, 2017) and mobility (AIRS_PO2.9, 2017) 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 have influenced 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)[1]. The Energy Efficiency Directive requires countries to set indicative targets for reducing their energy consumption and, within this context, to pursue the renovation of at least 3 % of buildings owned and occupied by central government annually and draw up long-term plans for renovation strategies of buildings[2]. 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 by 11 % over the 2005–2015 period examined (see also EEA, 2017a). Space heating accounts for approximately two thirds of energy used by households in the EU. The observed high consumption in Figure 1 for the years 2005, 2010 and 2013, for example, was mainly because of colder winters. Similarly the low consumption for the years 2007, 2011, 2014 and 2015, for example, was because of milder winters (EEA, 2016). The increase of 4 % in 2015 is mainly because of a slightly colder winter compared with 2014 — albeit still the third warmest winter in the 2005-2015 period.

Figure 1. Final energy consumption in the households sector, EU



Data sources: Eurostat. Final energy consumption in households (tsdpc320)

During the 2005-2015 period, 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 in the household sector. Increases in the number of appliances, average size of dwellings, number of dwellings and level of comfort partially offset these efficiency improvements (EEA, 2017b).

Energy efficiency improvements for space heating occurred as a result of the improved energy performance of buildings and the increased efficiency of 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 share of the most efficient appliances (A+, A++ or, more recently, A+++) in total sales 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). This Energy Union strategy 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. As part of the Energy Union strategy the European Commission proposed in December 2016 revised energy efficiency and energy performance of buildings directives that reinforce and extend in scope the existing directives.

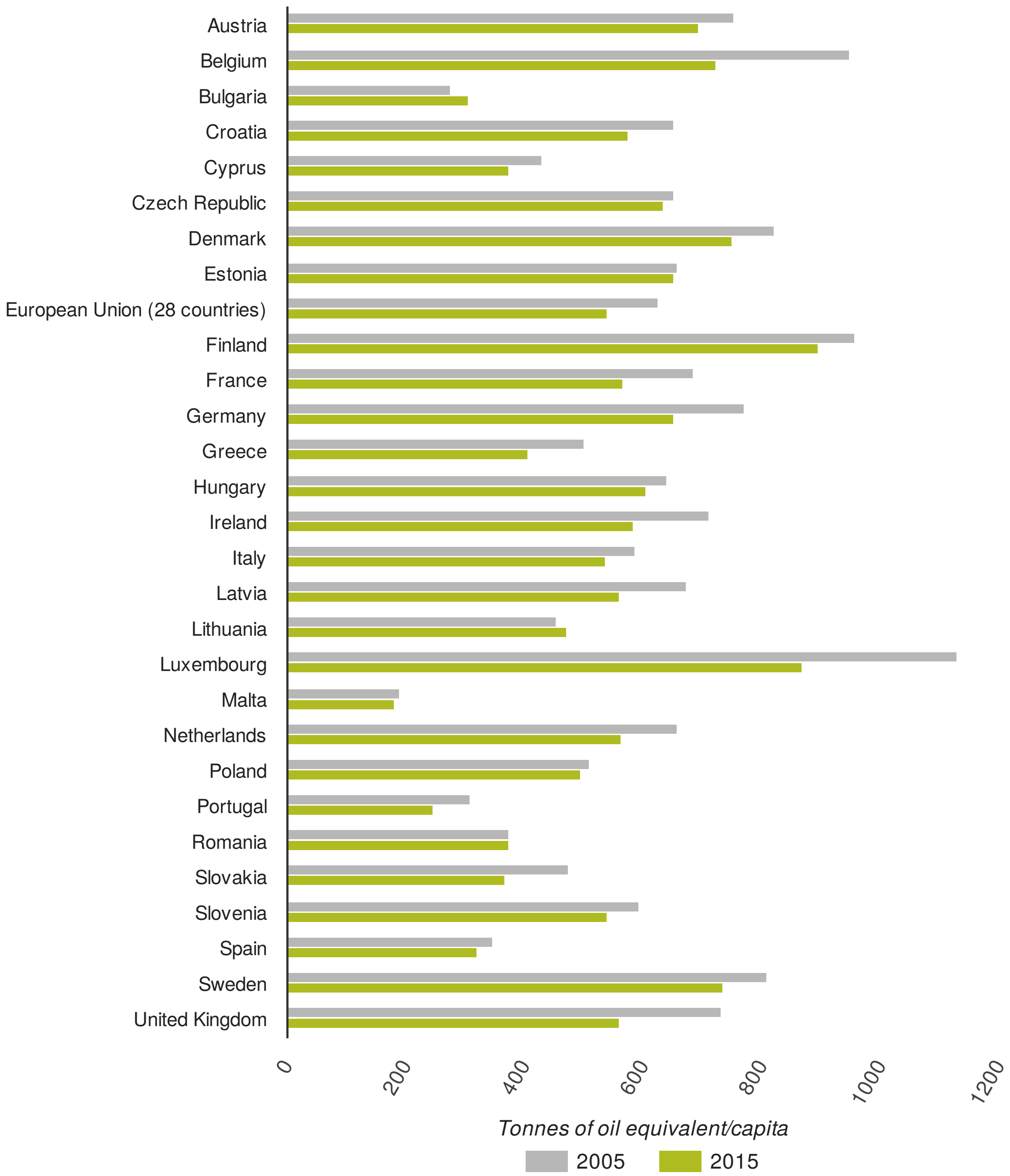
Looking to 2020, the proposed directives, and in particular the proposed energy efficiency targets for 2030, should help to keep the momentum towards increasing energy efficiency and lead to further reductions in the energy consumption of households.

Country Level Information

Figure 2 shows the per capita household energy consumption in the EU in 2005 compared with 2015.

Energy use in the household sector differs widely between countries because of weather conditions, the state and age of the building stock and household appliances, the average size of the dwellings, the heating/cooling systems used, behaviour (particularly with respect to cooking) and level of implementation of energy efficiency measures. In 2015, per capita energy consumption in the household sector ranged from 0.9 tonnes of oil equivalent per capita (toe/capita) in Spain and Latvia to 0.2 toe/capita in Portugal and Luxembourg.

Figure 2. Final energy consumption households per capita, 2015



Data sources: a. Eurostat. Statistics on population (tps00001)
b. Eurostat. Final energy consumption in households (tsdpc320)

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.

The proposed revised directives on energy efficiency and energy performance of buildings, and more broadly the Energy Union process, should drive further reductions in the energy consumption of households. This includes the proposed 30 % binding energy efficiency target for the EU as a whole by 2030. It also includes the Heating and Cooling Strategy (EC, 2016c) that should help reduce the energy consumption of households and their impact on the environment by promoting the increased use of district heating and better integration of renewable energy sources.

In the long run, the environmental impacts of housing will depend not only on the enforcement of the policy measures and goals that have been set, but also on life style choices (e.g. in terms of living space, consumption patterns, etc). This would, inter alia, depend on whether more possibilities for pursuing sustainable solutions would continue to be available to people, entrepreneurs and local authorities.

For example, reducing energy consumption in existing buildings presents a major challenge as the turnover of the building stock is slow. 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 consumer behaviour through the creation of framework conditions that can better enable the consumer to participate in the energy market (OpenExp, 2016).

About the indicator

Figure 1 represents final energy consumption by households at EU level. 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. Figure 2 represents the per capita energy consumption of the household sector by country.

Footnotes and references

[1] In order to reinforce and modernise the EPBD, the European Commission proposed in 2016 a revised EPBD (EC, 2016a). The proposed directive encourages the use of information and communication and other modern technologies, including building automation and charging infrastructure for electric vehicles, to ensure buildings operate efficiently. The proposed revised directive streamlines or deletes provisions that have not delivered the expected output and supports further and deeper building renovation with a view to decarbonising the building stock by mid-century.

[2] In 2016, the European Commission proposed a revised Energy Efficiency Directive (EC, 2016b). The proposed revision reinforces measures in the existing directive, for example on improving metering and billing of energy consumption for heating and cooling consumers. It also proposes energy efficiency targets for 2030 including extending beyond 2020 the energy saving obligation.

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EEA, 2016, 'Global and European temperature (CSI 012)' European Environment Agency (https://www.eea.europa.eu/data-and-maps/indicators/global-and-european-temperature-3/assessment) accessed 14 June 2017.

EEA, 2017a, forthcoming, 'Final energy consumption by sector (CSI 016)', European Environment Agency.

EEA, 2017b, forthcoming, 'Progress on energy efficiency in Europe (ENER 037)', European Environment Agency.

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://publications.jrc.ec.europa.eu/repository/bitstream/JRC101177/ldna27972enn.pdf) accessed 12 June 2017.

ODYSSEE, 2016, 'Key indicators' database (http://www.indicators.odyssee-mure.eu/) accessed 2 May 2017.

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) accessed 2 May 2017.

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Published on 30 Nov 2017

Resource efficiency and low carbon economy

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 2015 despite a decline between 2008 and 2013 following the economic recession. It is uncertain if emissions will reduce during the Seventh Environment Action Programme period (2014 - 2020); emissions in 2014 and 2015 as well as preliminary estimated emissions in 2016 increased while, according to projections by the EU Member States emissions are foreseen to decrease slightly between 2015 and 2020.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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 pollution and noise. Greenhouse gas emissions from the transport sector are 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 decline during the implementation period of the 7th EAP (2014-2020). EU transport emissions increased in 2014 and 2015 and preliminary estimates show increases also in 2016, even though the aggregate EU Member State greenhouse gas emission projections point to a slight decrease between 2015 and 2020.

Setting the scene

The 7th EAP calls for a reduction in the environmental impact of mobility (EU, 2013). The transport sector is a major contributor to climate change, air pollution, noise, natural resource depletion and land fragmentation. Reducing the environmental impact of transport can be addressed 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

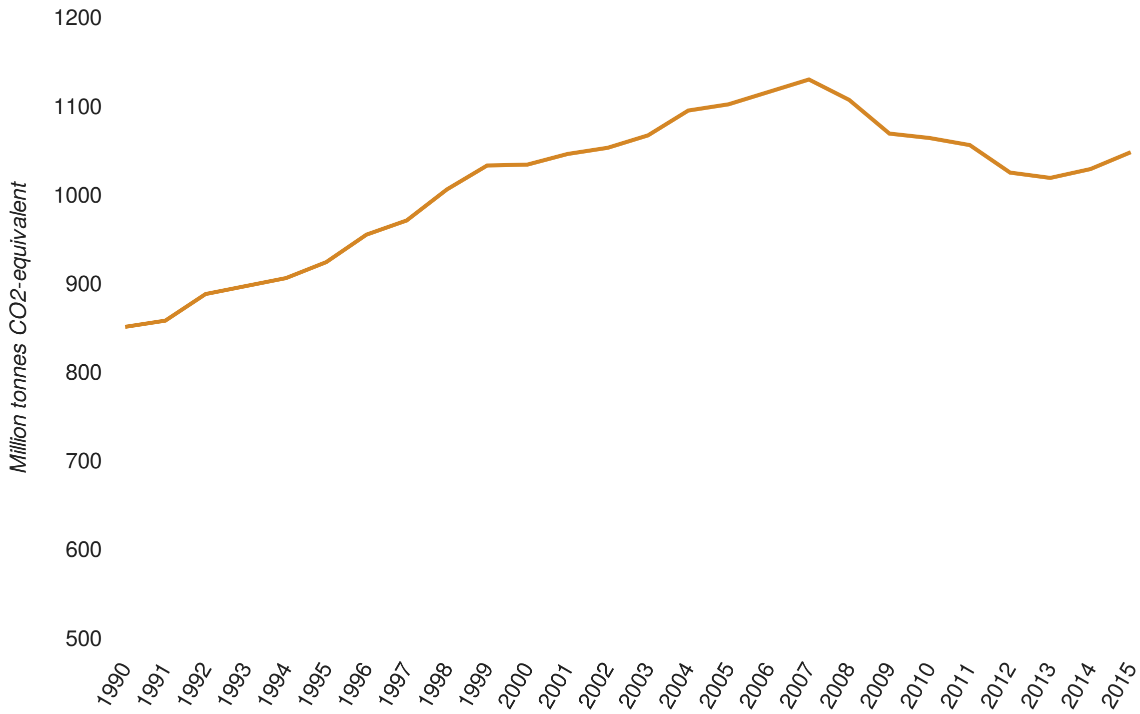
In 2011, the European Commission published a White Paper on transport entitled Roadmap to a Single European Transport Area — Towards a competitive and resource efficient transport system (EC, 2011). It acts as a framework to guide future policy developments in the transport sector over the next decade. 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 2015, EU greenhouse gas emissions from transport - reported by the Member States - increased by 23.1 % compared with 1990 levels (see Figure 1). This increase comes despite past improvements in the efficiency of transport and is broadly 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, 2017a, 2017b).

Emissions decreased from 2008 to 2013, mainly because of the lower levels of economic activity — manifesting also in lower levels of freight transport (EEA, 2017b) — following the 2008 economic recession, as well as further implementation of transport efficiency measures.

Road transport accounts for 72 % of the total greenhouse gas emissions of the sector (EEA, 2017c). On-going energy efficiency improvements in road transport has 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

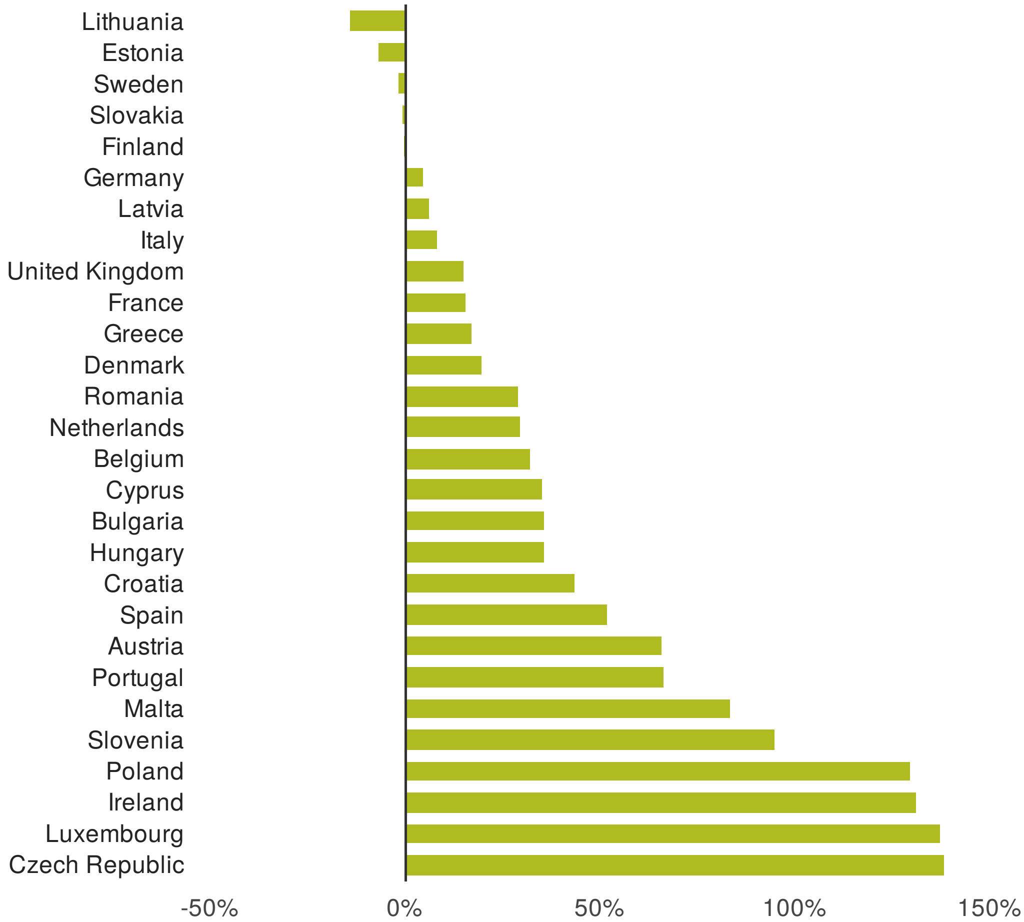


Data sources: a. EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism
b. EEA – Indicator TERM002

It is uncertain if transport greenhouse gas emissions will decline during the implementation period of the 7th EAP (2014 - 2020). According to official projections by the EU Member States, emissions for the EU (including international aviation but excluding international shipping) will decrease slightly between 2015 and 2020 in the two scenarios used: with existing measures and with additional measures (EEA, 2017d). Despite these forecasts, Member States have reported increased greenhouse gas emissions from transport (including from international aviation but excluding international shipping) in 2014 and 2015 (1 % and 1.9 % respectively) (see also Figure 2), and preliminary estimates made by EEA for the year 2016 also show emissions continued to further increase, by 2 % between 2015 and 2016 (EEA, 2017e).

Country level information

Figure 2. Change in greenhouse gas emissions from transport, 1990 to 2015, by country



Data sources: a. EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism
b. EEA – Indicator TERM002

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

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 by 60 % compared to 1990 levels by 2050. A key assumption in the White Paper is that technologies that contribute to lower greenhouse gas emissions, such as the electrification of road transport and development of sustainable fuels, will be increasingly available, especially after 2030. More recently the European Commission has also published a 'European Strategy for Low-Emission Mobility' (EC, 2016a) that identifies three priority areas for action:

1. [Further] increasing the efficiency of the transport system;
2. Speeding up the deployment of low-emission alternative energy for transport; and
3. Moving towards zero-emission vehicles.

A modal shift away from road transport is 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 waterborne transport 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, 2016b).

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 from transport activities 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, 2017f).

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.

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Resource efficiency and low carbon economy

Food consumption – animal based protein

Indicator	EU indicator past trend	Selected objective to be met by 2020	Indicative outlook of the EU meeting the selected objective by 2020
Animal product consumption (animal protein)		Reduce the overall environmental impact of production and consumption in the food sector - 7th EAP	

Per capita consumption of total protein from animal products (meat, dairy, eggs, and fish and seafood) remained relatively stable in the EU over the period examined (2000-2013). Per capita animal based product consumption is expected to increase over the 2014-2020 period for the vast majority of animal product categories and sub-categories.

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

The Seventh Environment Action Programme (7th EAP) aims to reduce the overall environmental impact 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. 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. Per capita total protein consumption from animal products (meat, dairy, eggs and fish and seafood) has been used here as a proxy indicator for the overall environmental impacts from food production and consumption. The per capita protein consumption from animal products remained relatively stable in the EU between 2000 and 2013 with a modest increase up to 2007 followed by a slight decrease to 2013. During the implementation period of the 7th EAP (2014-2020), the per capita consumption of animal-based products is expected to increase in the majority of the animal product categories and sub-categories.

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 24 % of the environmental impacts caused by total final consumption in the EU, based on a life cycle assessment method (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 protein from animal-based food products (meat, dairy, eggs, fish and seafood)[1], 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 to parts of the population (EuroHealthNet, 2013). For the housing and mobility sectors, please see the Household energy consumption briefing (AIRS_PO2.8, 2017) and the Transport greenhouse gas emissions briefing (AIRS_PO2.9, 2017).

Policy targets and progress

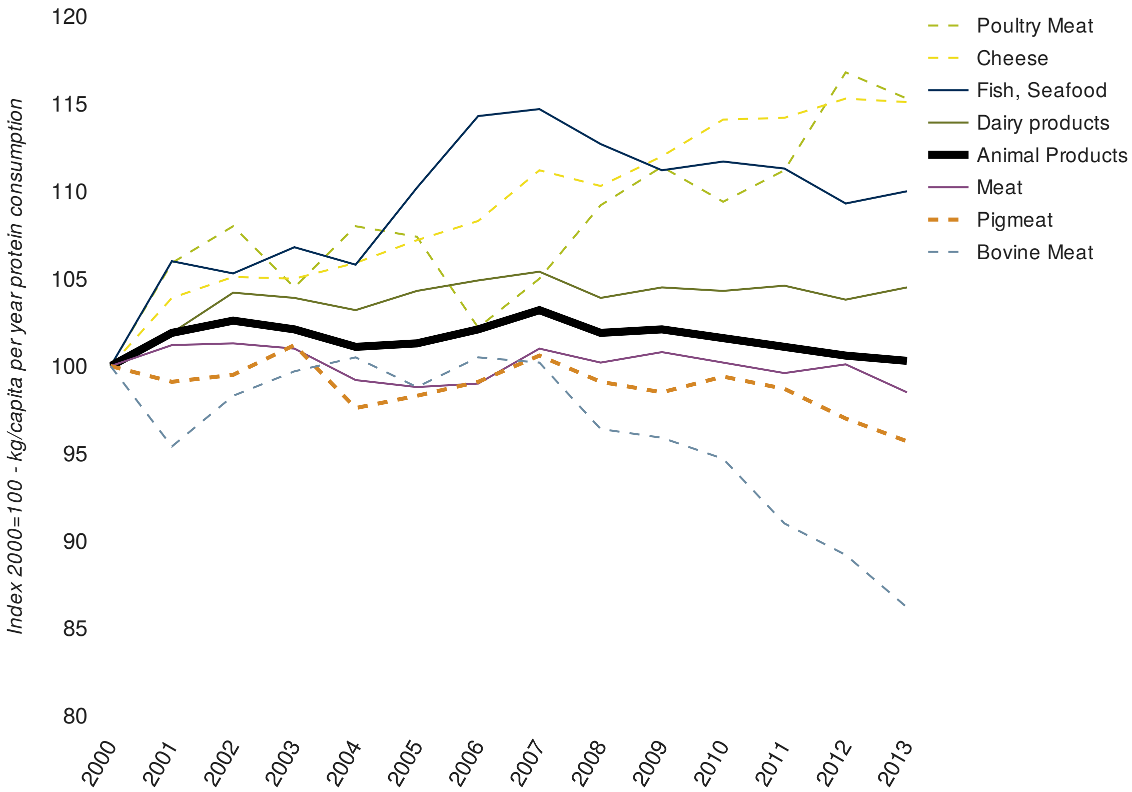
The food system is a major driver of environmental change, with implications for energy and water security. Although the EU has no explicit food policy, the food system cuts across a wide range of policy areas including agriculture, fisheries, biodiversity and health. The 7th EAP and the Roadmap to a 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[2].

Diets characterised by a high intake of animal products often result in consumption of saturated fat and red meat in quantities that exceed dietary recommendations. Consequently, dietary changes to a more varied diet, including shifting to non-animal based sources of protein, may have positive health effects for parts of the population. In addition, the production of animal products such as meat and dairy requires large areas of land and results in high greenhouse gas and nutrient emissions. In fact, a large proportion of the nutrient losses in Europe are related to the livestock sector. Next to improvements in nutrient use efficiency in all food chain activities and reduction of waste throughout the food chain, changing diets towards lower consumption of livestock products have been identified as the main levers to reduce nutrient losses (EEA, 2017a). Production of fish and seafood, on the other hand, especially impact marine but also freshwater ecosystems, while fish and seafood is recommended as part of a healthy diet, and aquaculture represents the most efficient method by which to convert feed to edible animal protein (EEA, 2016).

Overall, reducing the environmental pressures from food will require changes along the whole food value chain, starting with a more sustainable agriculture, sustainable food processing and transport, as well as diets that rely less on foodstuffs with high environmental impacts.

Figure 1 shows indexed EU trends over the 2000-2013 period for the per capita total animal protein consumption as well as for the most important animal based product (meat, dairy, and fish and seafood) categories and key subcategories.

Figure 1. Trends in per capita animal based protein consumption, total and by selected animal product category, EU



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

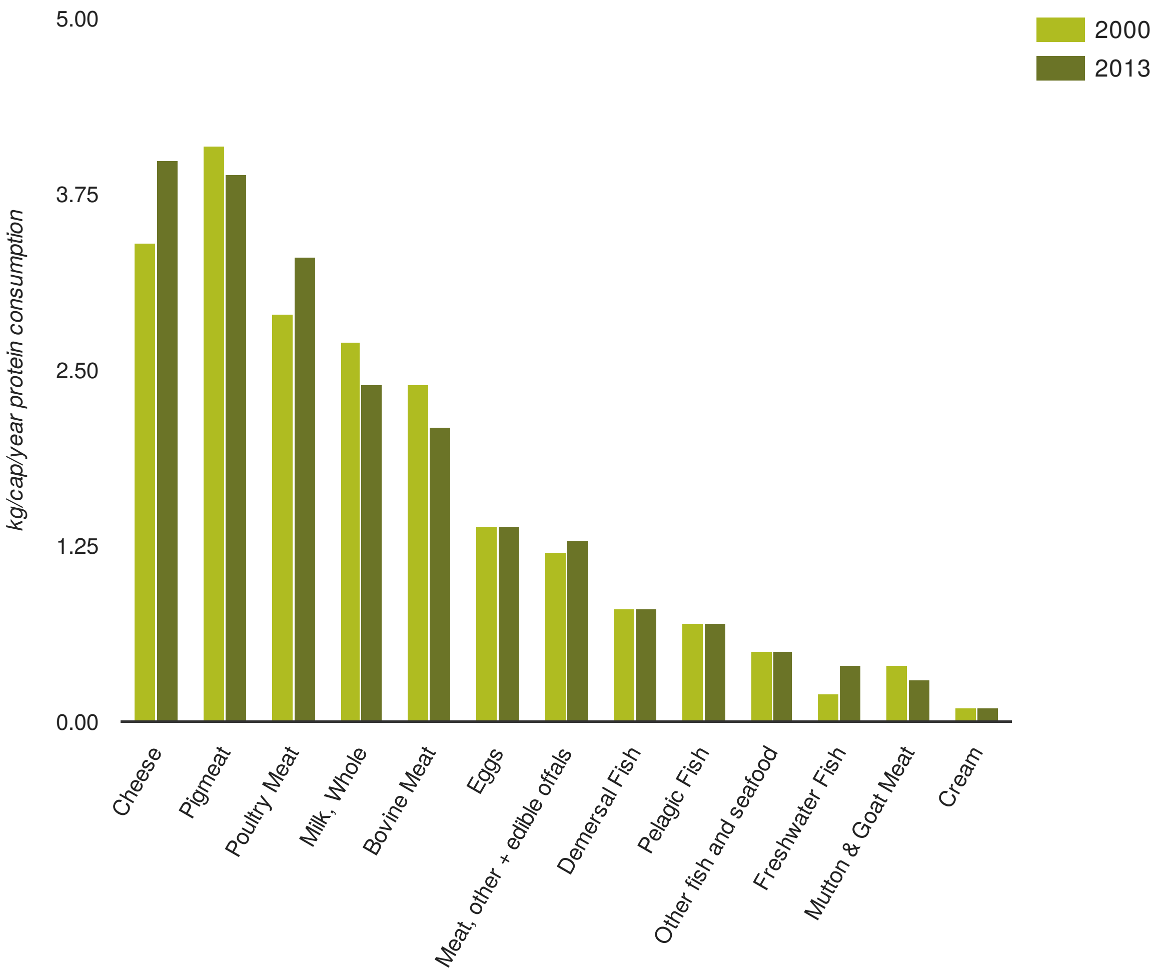
Note: Dotted lines show key sub-categories of the aggregated animal product categories

The per capita total animal protein consumption in the EU remained relatively stable from 2000-2013. It increased modestly up to 2007 and reduced slightly after that year. This trend masks a diverging trend in consumption of protein from different types of animal products: consumption of protein from cheese and poultry increased by about 15 % while bovine meat decreased by nearly 14 %. EU citizens on average also covered more of their protein needs with fish and seafood in 2013 than in 2000.

European dietary changes may have been brought about by increasing awareness of healthier diets, as well as price changes. Beef prices, for example, reached record highs in 2013 (EC, 2014).

Figure 2 shows the EU per capita protein consumption for 2000 and 2013 for several meat, dairy, egg, and fish and seafood products. Cheese and pig meat are the preferred animal based protein sources, followed by poultry, milk and bovine meat. Fish and seafood contribute 11 % to animal based protein supply.

Figure 2. Average per capita protein consumption of selected meat, fish, seafood, eggs and dairy products, EU



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

On average, an EU citizen consumed 22 kg per year of animal-based proteins and 16 kg per year of plant-based proteins (FAOSTAT, 2017).

Different food products have very different environmental footprints. 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, 2017).

In terms of consumption amounts of animal products (i.e. not just protein), the average EU citizen ate 2.2 kg less beef in 2013 than in 2000 (a 13 % decrease), but 3.0 kg more poultry (a 15 % increase), with pork consumption remaining relatively stable (EEA, 2017b). This shift will have led to a reduction in environmental impacts but this may have been somewhat offset by a 2.2 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).

The EU citizen ate on average about 1.7 kg more fish and seafood in 2013 than in 2000, an 8% increase. About 1.5 kg of this increase was consumption of fish. The remaining increased fish and seafood consumption comprised mainly of crustaceans (e.g. prawns, mussels) and cephalopods (e.g. squid). The increase in the consumption of fish and seafood during this period is in line with healthy eating advice, as long as the fish and seafood are not too heavily contaminated with hazardous substances.

It is difficult to assess the environmental implications of this trend. The EU imported around 55 % of its fish and seafood in 2013 from all continents of the world, with northern Europe being the largest supplier of fish and seafood. More and more fish is produced in aquaculture. Aquaculture generates, inter alia, emissions of nutrients, antibiotics and fungicides and relies on capture fisheries for feed (EEA, 2017c); however, aquaculture is still one of the most efficient methods to convert feed into edible animal protein (EEA, 2016). Globally, aquaculture production has been increasing steadily while capture production has stabilised since the 1990s (EEA, 2016).

At least three thirds of commercial fish stocks in Europe’s seas are not in good environmental status while fishing beyond sustainable levels is one of the reasons for this; for further information on the status of commercial fish stocks please see the Marine fish stocks briefing (AIRS_PO1.5, 2016). Although the situation has started to improve, in particular in the North-East Atlantic Ocean and the Baltic Sea, the progress may be compromised by the increasing consumption of fish, depending on the species consumed.

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).

Projections by the European Commission Directorate General for Agriculture and Rural Development (EC, 2016) show that the per capita consumption of the vast majority of the examined animal-based product categories is expected to increase over the 2014-2020 period. This includes cream, yoghurt, cheese, butter, skimmed milk powder, sheep and goat meat, poultry meat and eggs. Per capita consumption of beef and veal meat and of pig meat is expected to remain more or less stable, while the consumption of fresh and whole powdered milk is expected to decrease. Fish and seafood consumption were not examined.

Different food products have very different environmental footprints. Nevertheless, the vast majority of the examined animal-based product categories is expected to increase and the consumption of the high environmental footprint veal meat and pig meat is not expected to decrease. Further implementation of the environmental acquis and some efficiency gains in the food sector should limit some of the environmental impacts associated with the expected increase in the consumption of animal based products. However, there is no sufficient evidence that, by 2020, such improvements will outweigh the environmental impacts associated with the expected increases in consumption and will reduce the overall environmental impact of the food sector. In fact, both ammonia and greenhouse gas emissions from agriculture increased slightly in 2014 and in 2015 (see AIRS_PO3.2, 2017 for ammonia emissions and Eurostat, 2017 for greenhouse gas emissions); ammonia and greenhouse gas emissions from agriculture are dominated by emissions associated with livestock. There was also no discernible improvement at EU level in the nitrogen balance from agricultural land in 2014 (see AIRS_PO1.2, 2017) and there is little expectation of this improving to 2025, while in two regions — Catalonia (Spain), Lombardia (Italy) — the nitrogen balance can be expected to deteriorate because of increases in meat production (EC, 2016).

Finally, the increasing focus at both EU and Member State levels on reducing food waste through actions in the Circular Economy Package (EC, 2015a) and Member States' waste prevention strategies is, nevertheless, a positive development.

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 gas emissions. 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 indexed and absolute levels of protein per capita consumption of selected meat, dairy, eggs, and fish and seafood products in the EU between 2000 and 2013. The indicator also shows in indexed form the total per capita EU consumption of animal protein for 2000 to 2013. The data were extracted from the Food and Agriculture Organization of the United Nations (FAO) statistics database (FAOSTAT, 2017). The indicator is defined as the supply of these products to the final consumer. The amount of animal protein actually consumed may be lower than the quantity shown in the indicator because of wasted edible food by households and other final consumers. The FAO uses national food composition data to calculate the protein content of different foodstuffs and the resulting protein consumption (FAOSTAT, 2001).

References

[1] Last year's briefing (2016) showed trends in kilogram (kg) consumption of animal based products. The indicators in this year's briefing shifted to kg consumption of protein contained in animal based products. This was done in order to clean out the trends from the dominance of the high water content of milk, i.e. when measuring based on kg consumption of animal based products then the trend is dominated by milk because of its very high water content. With this change there is now full alignment with the recommended indicator in the European Commission Staff Working Document (Analysis associated with the roadmap to a Resource Efficient Europe part II; SEC(2011); 1067 final) for 'making food consumption healthier and more sustainable'.

[2] Halving food waste per capita at the retail and consumer level, and reducing food losses along production and supply chains has been adopted as a target within the UN Sustainable Development Goals (UN, 2015), and was confirmed as an EU goal in the 2015 Circular economy action plan (EC, 2015a).

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> Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

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Resource efficiency and low carbon economy

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 period examined and there are no indications of any change in the coming years

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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. Revenues from labour taxation remain eight times higher than the revenues generated by environmental taxes in the EU. These relative shares in overall taxes have changed very little over the years and only a limited number of EU countries have decreased their share of labour taxes while increasing their share 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 the vast majority of Member States that they intend to shift taxes from labour towards the environment, so the outlook for 2020 appears negative.

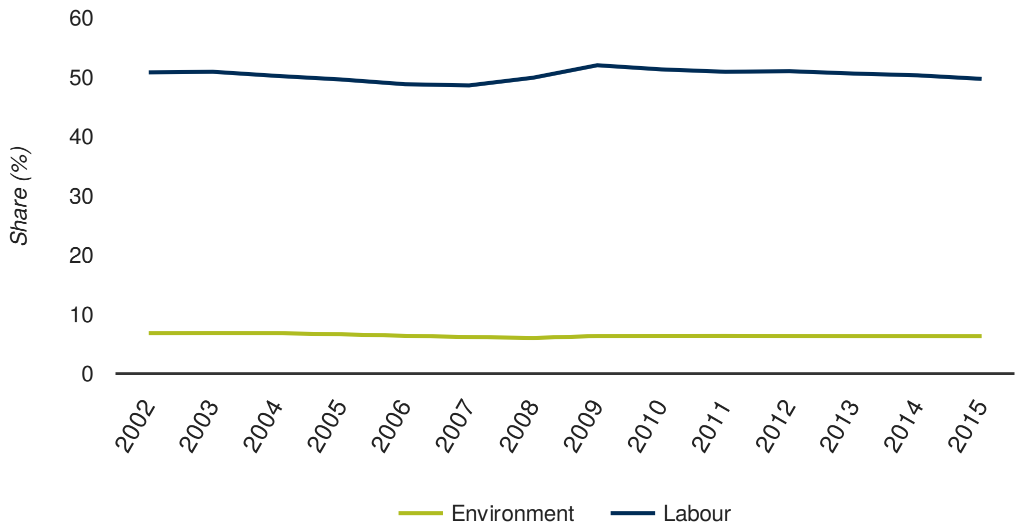
Setting the scene

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 that moves towards a resource-efficient economy (EC, 2011). Reducing taxation on labour can also encourage economic growth and, through targeted investment, can encourage the creation of jobs, for example in the recycling and energy efficiency sectors (EEA, 2013). Increasing environmental taxes and reducing labour taxes while keeping the overall tax burden constant is widely known as environmental fiscal reform.

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 in government revenues, in line with the best practice of Member States.

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



Data sources: European Commission. Data on taxation

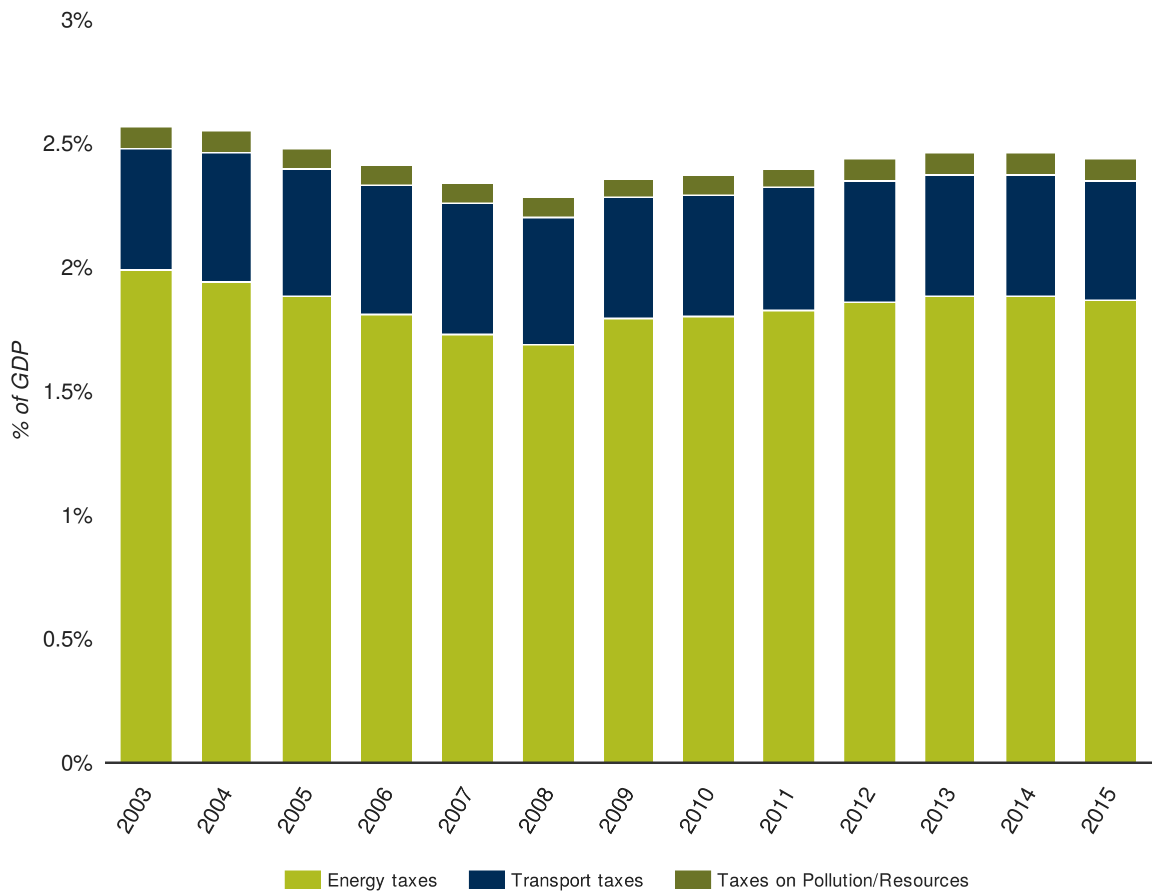
For the EU as a whole, there has been no progress over the last decade (Figure 1). At the beginning of the 2000s, there was a slight increase in the revenues from environmental taxes relative to labour taxes, but, since the economic downturn, this has not been sustained. The share of total revenues from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

The years following the 2008 economic downturn offered the opportunity to use environmental fiscal reform to address rising unemployment, i.e. to increase environmental taxes by reducing labour taxes and thereby encourage employment creation. The lack of any progress in such a tax shift 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 reform fiscal measures targeted at the production and consumption of energy from conventional sources (notably fossil fuels), e.g. by reinforcing carbon-pricing mechanisms and revisiting fossil fuel subsidies (IEEP, 2015).

In addition to taxing energy and carbon, pollution and resource taxes offer opportunities to further reduce environmental pollution and improve material resource efficiency (see the Resource efficiency briefing (AIRS_PO2.1, 2017)). Such taxes are still largely unused in the EU, comprising only 3.5 % of revenues from all environmental taxes in 2015, which corresponds to around

0.09 % of gross domestic product (GDP) in the EU (Figure 2). Over recent years there has been no sign of an increase in the share of pollution and resource taxes in environmental taxes, 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 the careful design and implementation of tax adjustments (IEEP, 2015).

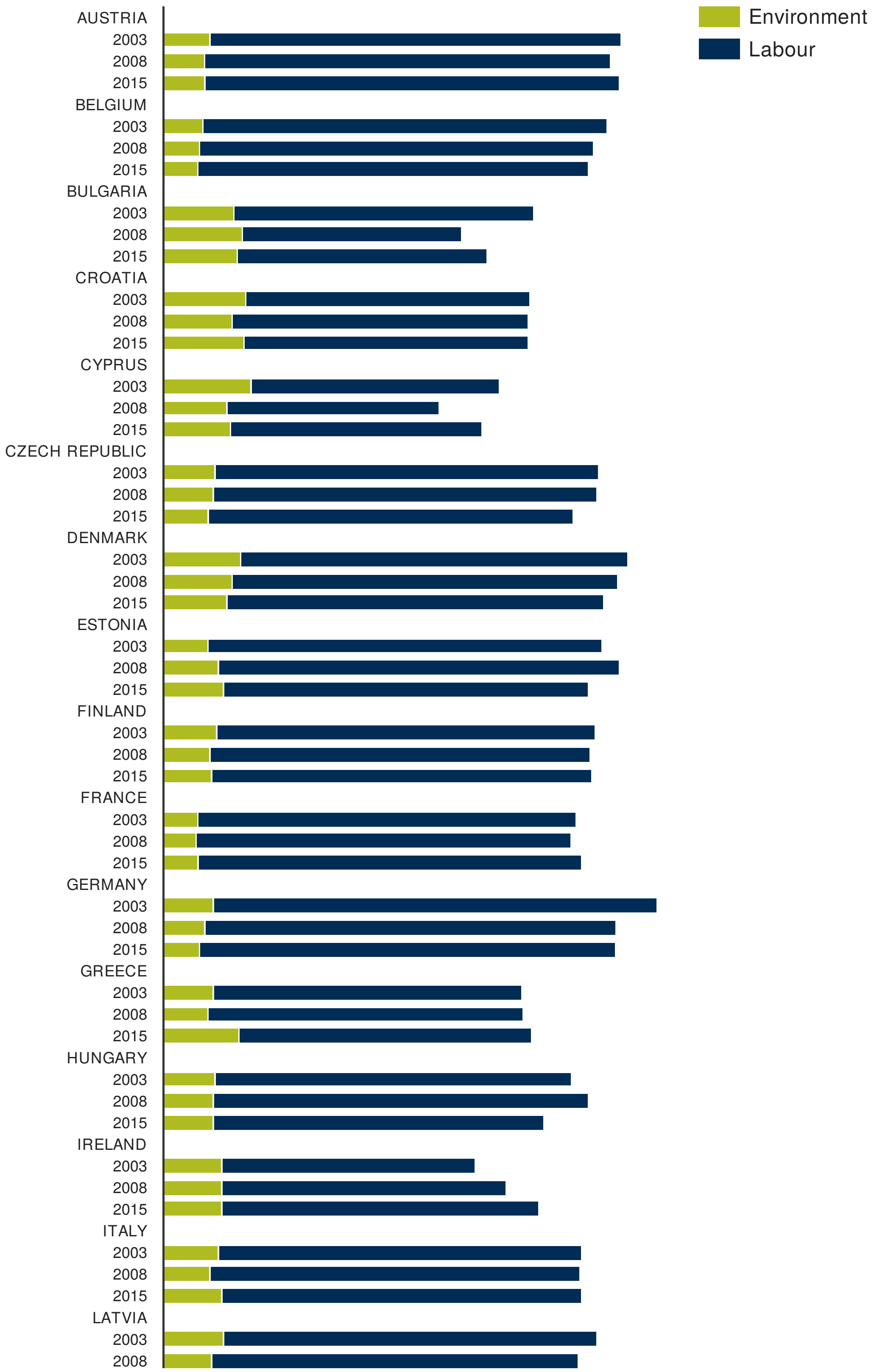
Another factor that limits changes to the relative levels of taxes is the high level of political attention that is generated by any changes to a country’s tax system. This can make any changes difficult and will tend to slow the pace of change. The political difficulties of modifying the fiscal system 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).

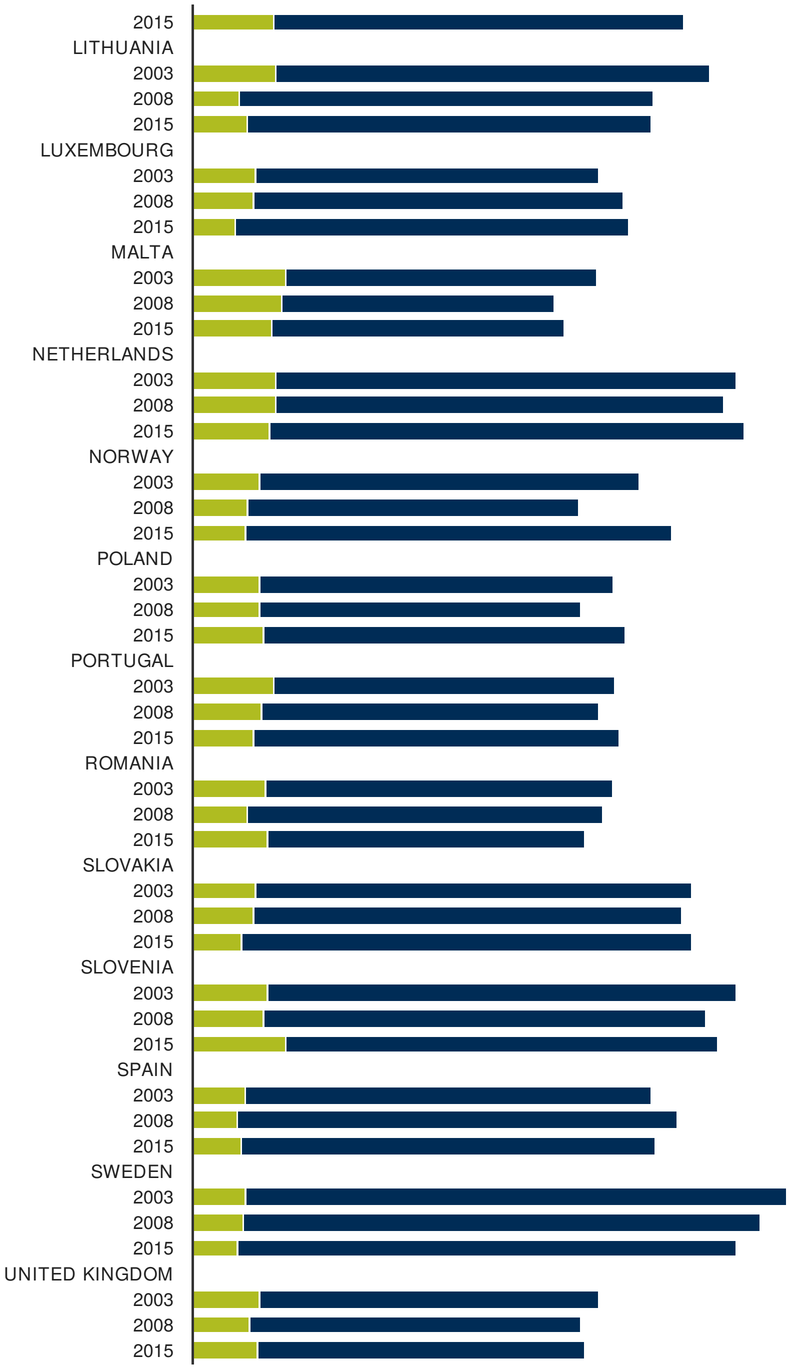
The absence of policies promoting a shift of the tax base from labour to environmentally damaging goods and practices over past years, and the lack of plans by the vast majority of Member States to implement these changes, make it unlikely that the 2020 objective will be met.

Country level information

When comparing the levels of environmental taxation across 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, 2017).

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





Data sources: European Commission. Data on taxation

Figure 3 illustrates the large differences amongst countries in the shares of both labour and of environmental taxation in the total revenues from taxes and social contributions. In 2015, the labour tax shares range from 34 % in Bulgaria to 57.6 % in Sweden while the environmental tax shares are from 4.7 % in Belgium to 10.9 % in Croatia.

In 2015, in only four EU Member States (Bulgaria, Croatia, Greece and Slovenia) was the share of total revenues from taxes and social contributions made up of environmental taxes greater than 10 %.

Seven EU Member States shifted taxation away from labour and towards the environment between 2003 and 2015 (Bulgaria, Estonia, Greece, Italy, Latvia, Romania and Slovenia). Nine Member States moved in the opposite direction (Austria, Croatia, Cyprus, Finland, Luxembourg, Portugal, the Netherlands, Slovakia and Spain) as well as Norway; however, some of these changes were 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 % in 2013 to 3.6 % of GDP 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 modifications to the national tax systems can be viewed as politically feasible.

The fiscal outlook in Europe has heightened political interest in the potential of environmental fiscal reforms. 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. 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.

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).

Since 2013, Eurostat collects data on environmental taxes by economic activity at a detailed level, under 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). In addition, Eurostat uses information in the National Tax Lists (NTL) supplied by EU Member States within the European System of Accounts transmission programme, to compile the data on total environmental taxes and their major categories. The NTL data are available with a shorter delay than the detailed data on environmental taxes collected under Regulation (EU)_No 691/2011, and are fully in line with key macroeconomic indicators. In order to ensure coherence between the two reporting systems, small adjustments are being made by Eurostat.

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Published on 30 Nov 2017

Resource efficiency and low carbon economy

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 (EGSS)	Employment in the EGSS	Value added in the EGSS	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 increased over the examined period of 2003-2014, although since 2011 growth in the sector's value added slowed and employment creation stagnated. The 2020 prospects of continued growth and employment creation in the sector 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

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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. Overall, over the 2003–2014 period, the environmental goods and services sector (EGSS) has grown faster than the rest of the EU economy, in terms of both employment and value added. The EGSS value added grew by 54 % and the employment by 41 % between 2003 and 2014. The main driver was growth in the renewable energy sector while an increase in public sector spending on green infrastructure played a role too. Since 2011 EGSS growth in value added slowed and employment creation stagnated 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.

Setting the scene

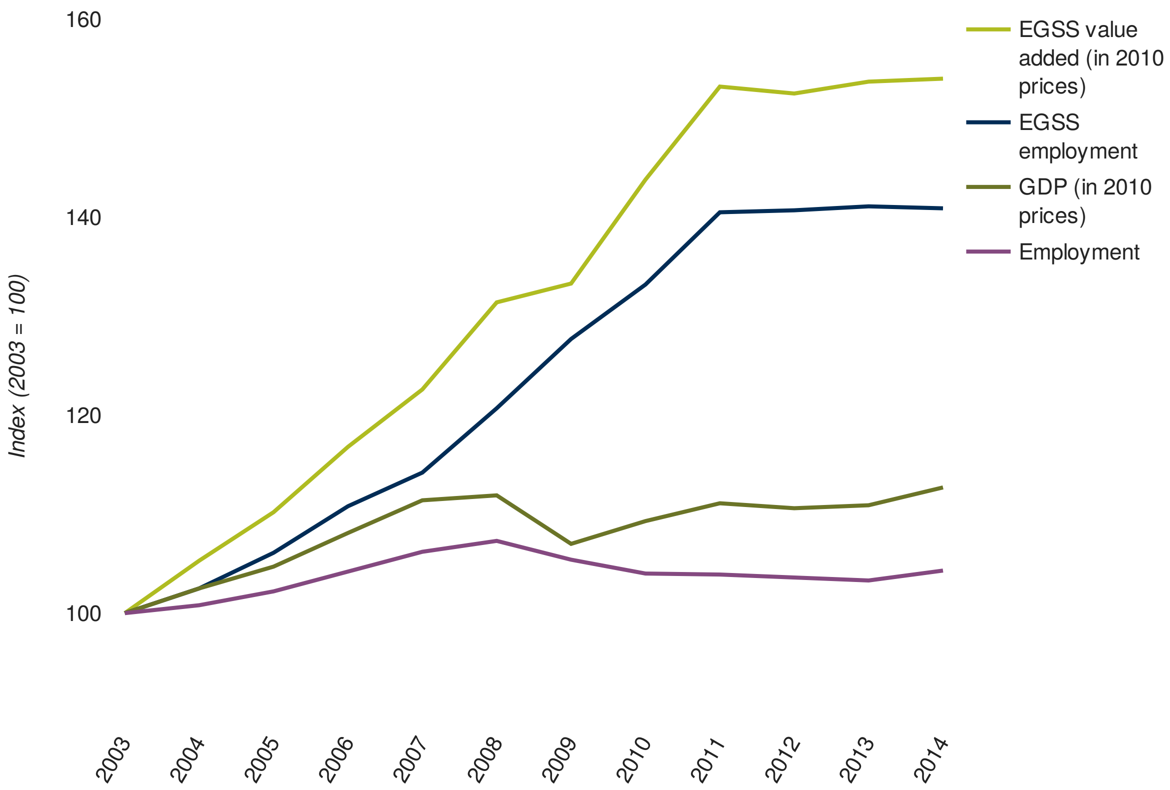
The 7th EAP (EU, 2013) calls for strengthening the market share of green technologies in the European Union and enhancing the competitiveness of European eco-industries. This will not only reduce the environmental pressures arising from economic activities but could also have important socio-economic benefits in terms of value added and employment. This briefing presents trends in value added and employment in the EGSS. The 7th EAP reflects the objectives of the Europe 2020 growth 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 as well as obligations to comply with the environmental acquis has led to an increase in 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 quantitative targets for increasing employment or for output from the EGSS. Nevertheless, the EGSS's environmental–economic accounts enable trends in headline macroeconomic indicators for the EGSS, such as value added and employment to be reported, providing information 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 EU environmental goods and services sector (EGSS) compared with the whole economy



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. Eurostat. 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)

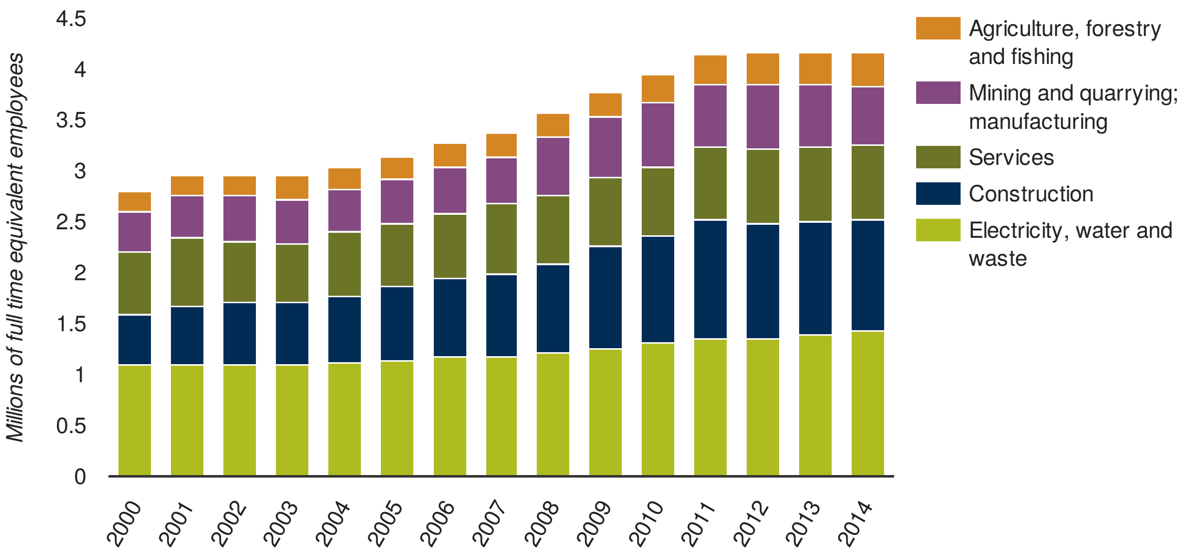
Note: The GDP and EGSS value added was deflated to 2010 values using the GDP deflator.

Figure 1 shows that, on average, since 2003, the EGSS has seen faster growth in employment and value added than the total EU economy. The sector's contribution to gross domestic product (GDP) grew from 1.5 % in 2003 to 2.1 % in 2014, while employment in the EGSS grew from 3.0 million full-time equivalents to 4.2 million over the same period.

Growth in both environmental protection 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 117.3 billion in 2014 (at 2010 prices), an increase of 133 %. The renewable energy sector was the key driver in the growth of the resource management area — the value added of the renewable energy sector increased by 179 % over the period — while an increase in products for energy and heat savings also played a key role. The increase in value added of the environmental protection activities over the same period was rather moderate - 25% between 2003 and 2014. Although the environmental protection activities still represent the major element of the EGSS (EUR 156.7 billion in 2014 at 2010 prices), the relative contribution of these activities in the EGSS growth has considerably decreased over time.

EU employment in environmental protection and resource management activities was estimated at 4.2 million full time equivalent employees in 2014 (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, 2017).

Figure 2. Employment by activity in the EU environmental goods and services sector



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

Note: The 'electricity, water and waste' category includes: electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities.

The expansion of the EGSS, which continued at a similar pace even in the years immediately after the 2008 economic downturn, partially resulted from innovation and Europe's competitiveness in the global market, but was also supported by public spending on environmental protection and renewable energy (Görlach et al., 2014; AIRS_PO2.13, 2017). Some of the most successful government interventions have been investment support schemes, which have 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).

Despite the successes of the sector, recent trends are not so positive, with employment creation stagnating and growth in value added having slowed in the sector since 2011. This may be explained by increasing competition from the United States and China (Görlach et al., 2014). This can also be explained by a decrease in domestic investments in renewable energy as a result of ongoing uncertainty on the future of support mechanisms and lower investment capacity in some EU Member States (Frankfurt School-UNEP Centre/BNEF, 2016) as well as because of a slow down by some Member States that have already met or are about to meet their 2020 renewable energy targets (AIRS_PO2.6, 2017). In 2014, EU investment in renewable energy sources was 51 % of the value (in current prices) of its 2011 investment, albeit the investment levels increased slightly (by 6 %) from 2013 to 2014 (Frankfurt School-UNEP Centre/BNEF, 2017) (AIRS_PO2.6, 2017). Another reason for the decrease in the value of the EU investment in renewables is the decline in recent years of the production costs of generating energy from renewable sources which brought down the investment costs (AIRS_PO2.6, 2017).

Overall, the future prospects for growth of the EGSS remain uncertain and 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). Being still at an initial stage of its development at the EU level, 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, as well as economic activities that focus on the use of natural resources, e.g. the use and extraction of minerals and hunting.

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. 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. For more information please see Eurostat, 2016a, 2016b, 2016c and 2017.

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Environmental indicator report 2017 – In support to the monitoring of the 7th Environment Action Programme, EEA report No21/2017, European Environment Agency

Published on 30 Nov 2017

Resource efficiency and low carbon economy

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	Deflated absolute value	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

For further information on the scoreboard methodology please see Box I.3 in the EEA Environmental indicator report 2017

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 the EU in real terms by 9 % over the 2006–2014 period and relative to GDP it increased by 0.09 percentage points – from 2.03 % of GDP in 2006 to 2.12 % of GDP in 2014. Most of the increase in EPE between 2006 and 2014 was driven by specialised producers. The public (i.e. government) sector also contributed substantially to the EPE growth while the industry sector contributed only moderately. To date, the highest expenditure and greatest growth in EPE has been in waste management. Since at least 20 % of the EU budget should be spent on climate change activities until 2020, it is likely that EPE will grow further.

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 Environmental Protection Expenditure; promoting activities and technologies aimed at preventing pollution and environmental degradation can reduce the environmental and climate impacts of economic activity. These activities and technologies can themselves have a positive impact on economic development and create business opportunities and jobs in the environmental goods and services sector (AIRS_PO2.12, 2017). However, increased spending can also reflect responses to growing environmental pressures and impacts on the environment.

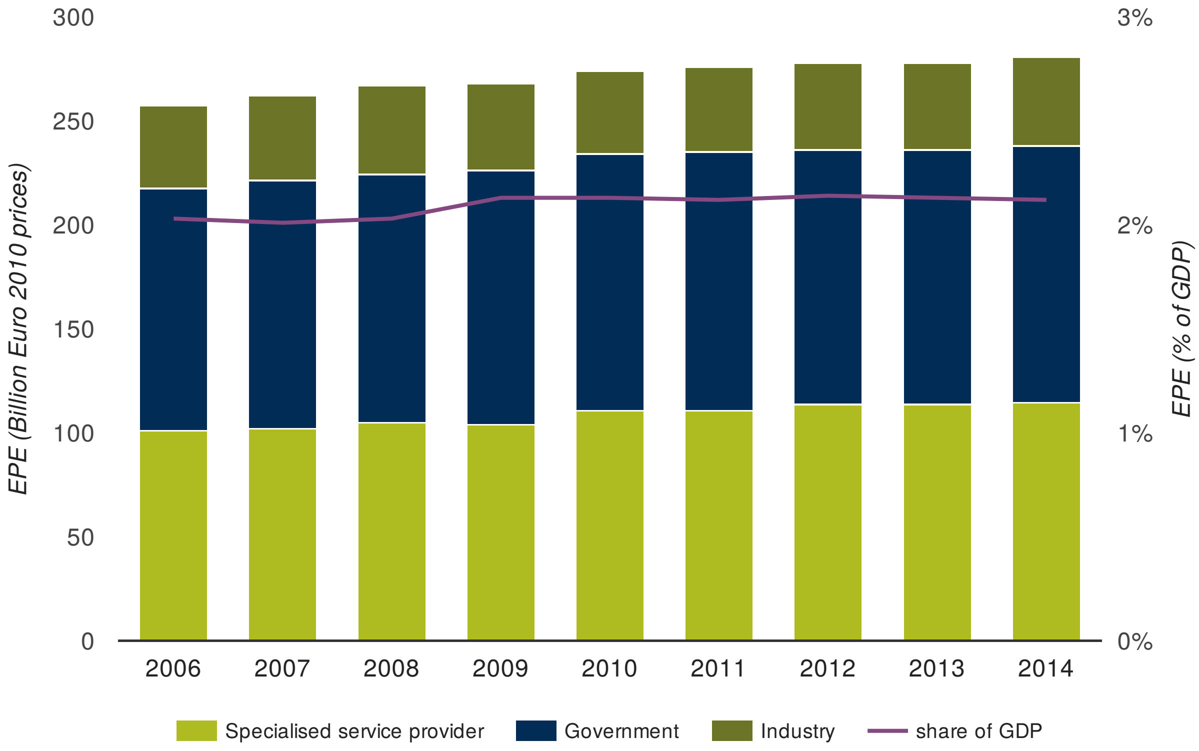
Policy targets and progress

The 7th EAP Priority Objective 6 (to secure investment for environment and climate policy and address environmental externalities) identifies the need to increase both public and private sector environment and climate-related expenditure. This is key to the achievement of the 7th EAP Priority Objective 2 (to turn the Union into a resource-efficient, green and competitive low-carbon economy), the monitoring of which this briefing contributes to. It is for this reason that EPE is examined here.

EPE has grown over the 2006–2014 period by 9 % in real terms and, in 2014, reached an estimated amount of EUR 281 billion (deflated to 2010 prices) (Figure 1). The proportions of expenditure of the public sector (i.e. government), 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 period. The public sector accounted for about 45 % of total EPE, specialised producers for 40 % and industry for 15 %. Most of the increase in total EPE over the 2006-2014 period was driven by specialised producers; their contribution, deflated to 2010 prices, increased by EUR 14 144 million over the period. The public sector also contributed significantly to the overall EPE increase (it spent EUR 6 717 million more in 2014 than in 2006), while the industry sector contributed as little as EUR 2 317 million to the increase.

EPE experienced a lower growth rate between 2008 and 2009 probably because of the financial crisis. However, the slower growth can be explained by a contraction in industry and specialised providers. Public expenditure 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). However, a slight reduction in public EPE (when expressed in prices deflated to 2010) occurred in 2012 and 2013. The overall increasing trend in EPE in the public sector also protected the environmental goods and services sector in Europe from the economic downturn (AIRS_PO2.12, 2017). However, it should be noted that the main reason for growth in this sector was a continuous increase in renewable energy activities and the EPE indicator does not capture this.

Figure 1. Environmental protection expenditure by institutional sector, and as percentage of GDP, EU

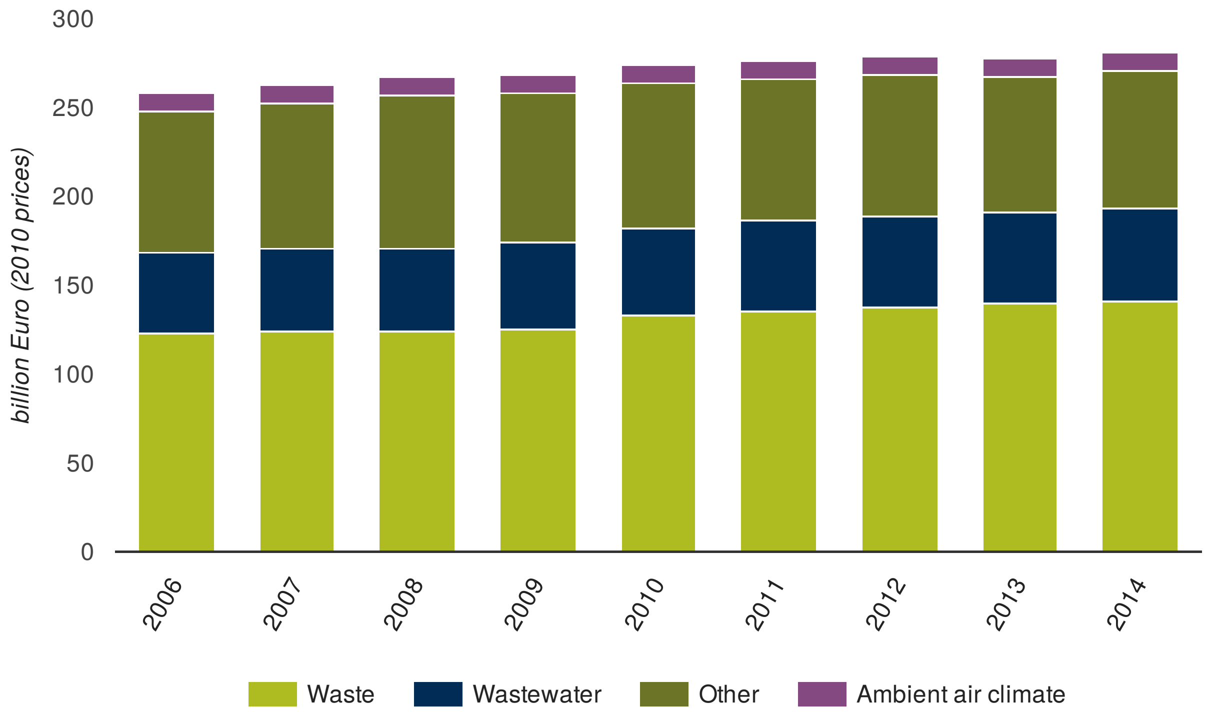


Data sources: a. Eurostat. Production of environmental protection services of general government by economic characteristics [env_ac_pepsgg]
b. Eurostat. Production of environmental protection services of corporations other than specialised producers by economic characteristics and NACE Rev. 2 activity [env_ac_pepsnsp]
c. Eurostat. Production of environmental protection services of corporations as specialised producers by economic characteristics [env_ac_pepssp]
d. Eurostat. GDP and main components (output, expenditure and income) [nama_10_gdp]

Note: Values are deflated to 2010 prices by EEA using the GDP deflator.

The share of overall EPE in GDP increased by 0.09 percentage points, from 2.03 % of GDP in 2006 to 2.12 % of GDP in 2014. The share slightly increased during the period of the economic and financial crisis, i.e. between 2008 and 2009. Since then the growth rates of EPE and GDP exhibited similar trends and therefore the ratio of EPE to GDP remained relatively constant from 2010-2014.

Figure 2. Environmental protection expenditure by environmental domain, EU



Data sources: a. Eurostat. Production of environmental protection services of general government by economic characteristics [env_ac_pepsgg]
b. Eurostat. Production of environmental protection services of corporations other than specialised producers by economic characteristics and NACE Rev. 2 activity [env_ac_pepsnsp]
c. Eurostat. Production of environmental protection services of corporations as specialised producers by economic characteristics [env_ac_pepssp]

Notes:

1. Values are deflated to 2010 prices by EEA using the GDP deflator.
2. The domain 'Other' includes the following environmental protection activities as classified under CEPA (Classification of Environmental Protection Activities): 'protection and remediation of soil, groundwater and surface water', 'noise and vibration abatement', 'protection of biodiversity and landscapes', 'protection against radiation', 'environmental research and development' and 'other environmental protection activities'.

Figure 2 shows EPE estimated levels (deflated to 2010 prices) at EU level broken down by environmental domain in the same 2006-2014 period.

Most expenditure was on waste management, followed by wastewater treatment. The growth in EPE has been driven primarily by growth in waste management expenditure.

The EPE will only partly capture climate-related expenditure. Nevertheless, since the EU took the decision that at least 20 % of its 2014–2020 budget will be used on climate change activities (EC, 2013), it seems likely that environmental protection expenditure will increase by 2020.

Country level information

Examining the 2006–2014 country data that underpins Eurostat's publication (Eurostat, 2017a), it can be seen that the EPE-to-GDP ratio varies strongly across countries. In Austria the proportion was over 3 % on average between 2006 and 2014, while in Cyprus, Finland, Greece, Norway, Sweden and the UK, the proportion is lower than 0.75 %. This wide gap reflects differences in economic structure (e.g. type of industry, type of energy source used). In most countries it is the government sector (i.e. the public sector) that provides the waste collection and wastewater treatment services; hence, government expenditure is concentrated on these environmental domains. However, these conclusions should be interpreted with great caution due to gaps in the country data (some countries and/or years and/or breakdown by institutional sector are missing).

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 on 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 – given the definition and scope of the EPE. The air pollutant emission reduction commitments for 2030 that were adopted under the new National Emissions Ceiling Directive (EU, 2016) 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

The environmental protection expenditure indicator 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 measures investments aimed at preventing, reducing and eliminating pollution and environmental degradation. The EPE indicator estimates country spending on these activities in deflated prices (2010 is used as the 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 institutional sector (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 (Eurostat, 2017b).

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 and it is therefore expected that this will improve further the quality of the data. Up to 2017, data collection has been voluntary and carried out by some countries only. Eurostat has been producing estimates at EU level through gap filling

Although the EPE 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 as EPE does not cover resource management activities. Therefore, it does not fully capture expenditure with a view to achieving climate policy objectives.

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