Smarter, greener, more inclusive?

INDICATORS TO SUPPORT THE EUROPE 2020 STRATEGY

2017 edition

STATISTICAL BOOKS

eurostat

Smarter, greener, more inclusive?

INDICATORS TO SUPPORT THE EUROPE 2020 STRATEGY

2017 edition

Printed by Imprimerie Centrale in Luxembourg

Manuscript completed in July 2017

Luxembourg: Publications Office of the European Union, 2017

Print	ISBN 978-92-79-70106-1	ISSN 2363-2194	doi:10.2785/092296	KS-EZ-17-001-EN-C
PDF	ISBN 978-92-79-70105-4	ISSN 2363-2208	doi:10.2785/760192	KS-EZ-17-001-EN-N

Contents

Foreword of Vice-President Katainen and Commissioner Thyssen

The Europe 2020 strategy is the European strategy for creating smart, sustainable and inclusive growth since 2010. It has been instrumental in preparing strategic choices for the European Commission's work. It led to the creation of the European Semester, which has become a powerful instrument to provide guidance for the Member States in their structural reforms and sustainable fiscal policies.

This publication by Eurostat provides up-to-date data in the areas covered by the Europe 2020 strategy which is important for our policymaking and helps to monitor progress towards the strategy's objectives.

The first years of the Europe 2020 strategy coincided with the financial and economic crisis, and progress towards the targets has been mixed. Already today, we have achieved our objectives for 2020 regarding greenhouse gas emissions and final energy efficiency, while being very close to reaching our education targets. More recently, we have seen continued progress regarding employment. The situation is improving in almost all Member States and the employment target is also within reach. More still needs to be done to invest in research and innovation and to fight against poverty and social exclusion. The Commission will keep up its efforts to support these positive trends with all of its different policy initiatives: from the smart use of EU budgetary resources to providing the right regulatory incentives. A forceful implementation also at national level will help achieve progress.

To achieve the objectives of the Europe 2020 strategy, the Commission will also continue to boost investment, pursue structural reforms in Member States and ensure responsible fiscal policies. The implementation of the Investment Plan for Europe is an important part of this strategy and we are grateful for Eurostat's crucial role in having provided more clarity and transparency on public accounting rules in Europe.

Jyrki Katainen
Vice-President
European Commission
Jobs, Growth, Investment
and Competitiveness

Marianne Thyssen
Commissioner
European Commission
Employment, Social Affairs,
Skills and Labour Mobility
Responsible for Eurostat

Foreword of Eurostat's acting Director-General

Eurostat — the statistical office of the European Union — plays a key role in informing governments, businesses and members of the public about important economic, social and environmental developments at EU level, in particular with regard to key European policy initiatives. For this purpose, Eurostat produces annual flagship publications, which provide statistical analyses related to these initiatives and other relevant topics.

Our flagship publication 'Smarter, greener, more inclusive? — Indicators to support the Europe 2020 strategy' presents the progress of the EU and its Member States towards the targets of the Europe 2020 strategy.

The current 2017 edition builds upon and updates the previous releases. Based on data mostly produced by the European Statistical System (ESS), it is structured along five thematic areas. They are: employment, R&D and innovation, climate change and energy, education, poverty and social exclusion.

The strategy's headline indicators provide a description of long-term trends. Additional contextual indicators, offered to broaden the general picture, shed light on the specific segments of society. They highlight the driving forces behind a given headline indicator or provide interesting insights into issues closely related to the main targets.

Impartial and objective statistical information is essential for evidence-based political decision-making. Eurostat is fully committed to supporting the implementation and monitoring of the Europe 2020 strategy by producing and supplying high quality statistical data.

We hope that this publication will bring our data closer to users by explaining topics of daily interest and importance for our societies.

Mariana Kotzeva
Acting Director-General of Eurostat

Acknowledgements

Editor-in-chief

Simon Johannes Bley (Eurostat, Unit E2 – Environmental statistics and accounts; sustainable development)

Editors

Markus Hametner, Asya Dimitrova, Renate Ruech (WU Vienna), Ariane De Rocchi, Eva Gschwend, (INFRAS), Katharina Umpfenbach (Ecologic Institute)

Co-editors

Fritz Gebhard, Barbara Margarethe Kurkowiak, Nicola Massarelli, Christine Mayer, Irina Schön, Anton Steurer, Lisa Waselikowski (Eurostat, Unit E2 — Environmental statistics and accounts; sustainable development), Carolyn Avery (ENDS, Haymarket Media Group Ltd)

Production

Production: Carolyn Avery (co-ordinator) and Nicole Schroeder (ENDS, Haymarket Media Group Ltd)

Infographics: Leonard Dickinson; Carolyn Avery (ENDS, Haymarket Media Group Ltd), Renate Ruech (WU Vienna)

Expert advisors

Gita Bergere, Maaike Bouwmeester, Elodie Cayotte, Fernando Diaz Alonso, Frank Espelage, Sabine Gagel, Antigone Gikas, Ángeles Hermosa López, Agata Kaczmarek-Firth, Hannah Kiiver, Jacques Lanneluc, Håvard Lien, Stephan Moll, Fabienne Montaigne, Stefania Panaitescu, Cristian Rusu, Juraj Stancik, Marek Sturc, Geneviève Villette (Eurostat)

Data coverage and direct links to Eurostat's database

The data presented in this publication were extracted during March-June 2017.

An online data code available under each table/figure can be used to directly access to the most recent data on Eurostat's website, at:

http://ec.europa.eu/eurostat/data/database

For more information please consult

Eurostat
Bâtiment Joseph Bech
5, rue Alphonse Weicker
2721 Luxembourg
http://ec.europa.eu/eurostat
E-mail: estat-user-support@ec.europa.eu

Disclaimer

Executive summary

Overview of trends in the Europe 2020 headline indicators

Nine headline indicators and additional sub-indicators support the monitoring of the Europe 2020 strategy's eight targets. The development of these indicators since 2008, the baseline year for monitoring the Europe 2020 strategy, shows a rather mixed picture. Substantial progress has been made in the areas of climate change and energy, as well as in education. However, there is still some way to go to meet the targets on R&D investment, employment and poverty alleviation, although more recent developments for the latter two are promising.

The Europe 2020 strategy

Europe 2020 is the EU's agenda for jobs and growth for the current decade. It emphasises smart, sustainable and inclusive growth as a way to strengthen the EU economy and prepare its structure for the challenges of the next decade. The strategy strives to deliver high levels of employment, productivity and social cohesion in the Member States while reducing the impact on the natural environment.

To reach this objective, the EU has adopted eight ambitious targets in the areas of employment, research and development (R&D), climate change and energy, education, and poverty reduction, to be reached by 2020. These have been translated into national targets to reflect the situation and possibilities of each Member State to contribute to the common goals. A set of nine headline indicators and additional sub-indicators provides an overview of how fast the EU is progressing towards its overall targets and how far it still has to go to reach them.

Since 2008, substantial progress has been made in the area of climate change and energy through reduced greenhouse gas emissions and increased use of renewable energy sources. Positive developments are also visible in the area of education, where the EU is within reaching distance of both headline targets. While the EU remains at a significant distance from its targets on R&D investment, employment and poverty alleviation, the most recent developments in the latter two areas are encouraging and the targets are still within reach for 2020.

The analysis in this 2017 edition of 'Smarter, greener, more inclusive?' aims to shed light on the trends in the headline indicators over the past seven years, from 2008 up to 2015 or 2016 (depending on data availability).

Employment rate

71.1 % of the EU population aged 20 to 64 were employed in 2016, up from 70.1 % in 2015. This is by far the highest share that has been observed since 2002. As a result, the distance to the Europe 2020 employment target of 75 % narrowed to 3.9 percentage points. Compared with other major economies in the world, the EU's employment rate lags behind some countries such as Japan, the United States, Russia and China.

A considerably lower employment rate was observed for young people aged 20 to 29 than for those aged 30 to 54. The employment gap between these two cohorts has been increasing over the past years. Older people (aged 55 to 64 years) were another vulnerable group on the labour market. Although their employment rate has grown continuously over the past decade, it still remains low compared to younger age groups. The gender employment gap has narrowed for all age groups since 2002. In 2016, the largest gap was observed for the age group 30 to 34 (14.3 percentage points).

Other factors influencing integration into the labour market are educational attainment levels and country of origin. Just slightly more than half of those with at most primary or lower secondary education in the EU were employed in 2016, compared to 83.4 % for those with tertiary

Table 0.1: Europe 2020 headline indicators, EU-28, 2008 and 2012–2016

Topic	Headline indicator	2008	2012	2013	2014	2015	2016	Target
Employment	**Employment rate age group 20–64, total** (% of population)	70.3	68.4	68.4	69.2	70.1	71.1	75.0
	• **Employment rate age group 20–64, females** (% of population)	62.8	62.4	62.6	63.5	64.3	65.3	:
	• **Employment rate age group 20–64, males** (% of the population)	77.8	74.6	74.3	75.0	75.9	76.9	:
R&D	**Gross domestic expenditure on R&D** ([1]) (% of GDP)	1.84	2.01	2.03	2.04	2.03	:	3.00
Climate change and energy	**Greenhouse gas emissions** ([2]) (Index 1990 = 100)	90.6	82.1	80.5	77.4	77.9	:	80.0
	Share of renewable energy in gross final energy consumption (%)	11.0	14.4	15.2	16.1	16.7	:	20.0
	Primary energy consumption (Million tonnes of oil equivalent)	1,692	1,585	1,570	1,508	1,530	:	1 483
	Final energy consumption (Million tonnes of oil equivalent)	1,180	1,106	1,106	1,060	1,082	:	1 086
Education	**Early leavers from education and training, total** ([3]) (% of population aged 18–24)	14.7	12.7	11.9	11.2	11.0	10.7	< 10.0
	• **Early leavers from education and training, females** ([3]) (% of population aged 18–24)	12.7	10.9	10.2	9.6	9.5	9.2	:
	• **Early leavers from education and training, males** ([3]) (% of population aged 18–24)	16.6	14.5	13.6	12.8	12.4	12.2	:
	Tertiary educational attainment, total ([3]) (% of population aged 30–34)	31.1	36.0	37.1	37.9	38.7	39.1	≥ 40.0
	• **Tertiary educational attainment, females** ([3]) (% of population aged 30–34)	34.3	40.2	41.4	42.3	43.4	43.9	:
	• **Tertiary educational attainment, males** ([3]) (% of population aged 30–34)	28.0	31.8	32.8	33.6	34.0	34.4	:
Poverty and social exclusion	**People at risk of poverty or social exclusion, EU-27** ([4]) (Million people)	115.9	122.2	121.4	120.7	117.6	:	96.2 ([5])
	People at risk of poverty or social exclusion, EU-28 ([4]) (Million people)	:	123.6	122.7	121.9	118.8	:	
	People at risk of poverty or social exclusion, EU-28 ([4])([6]) (% of population)	23.7	24.7	24.6	24.4	23.7	:	:
	• **People living in households with very low work intensity, EU-28** ([6]) (% of population aged 0–59)	9.2	10.5	10.9	11.2	10.6	:	:
	• **People at risk of poverty after social transfers, EU-28** ([6]) (% of population)	16.5	16.8	16.7	17.2	17.3	:	:
	• **Severely materially deprived people, EU-28** ([6])([7]) (% of population)	8.5	9.9	9.6	8.9	8.1	7.8	:

([1]) 2015 data are provisional.
([2]) Total emissions, including international aviation, but excluding emissions from land use, land use change and forestry (LULUCF).
([3]) Break in time series in 2014 (switch from ISCED 97 to ISCED 2011).
([4]) The indicator 'people at risk of poverty or social exclusion' corresponds to the sum of persons who are: at risk of poverty after social transfers, severely materially deprived or living in households with very low work intensity. Persons are only counted once even if they are present in several sub-indicators.
([5]) The overall EU target is to lift at least 20 million people out of the risk of poverty and exclusion by 2020. Due to data availability issues, the target is evaluated only for the EU-27.
([6]) EU-27 data for 2008.
([7]) Data for 2016 are estimates and provisional.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

education. The employment rate of non-EU nationals (aged 20 to 64) was 14.5 percentage points lower than the overall rate in 2016. People who migrated to the EU to join their families or for international protection were among the groups with the lowest employment rates in the labour market.

Gross domestic expenditure on research and development (R&D)

R&D expenditure in the EU stood at 2.03 % of GDP in 2015, compared with 2.04 % in 2014. Gross domestic expenditure on R&D as a percentage of GDP increased slightly between 2008 and 2012, as a result of depressed GDP growth and a wider EU effort to boost public expenditure on R&D, and has stagnated around 2 % of GDP since then. This means that by 2015, the EU was still 0.97 percentage points below its 2020 target, which calls for increasing combined public and private R&D expenditure to 3 % of GDP. The EU is still lagging behind its Asian and American competitors in terms of R&D intensity, with only the best performing Member States surpassing the United States.

Business enterprise remains the largest R&D performing sector in the EU, accounting for 64.0 % of total R&D expenditure. The business sector has also recorded the largest increase since 2002. The higher education and government sectors contribute less to total R&D expenditure, at 23.2 % and 12.0 %, respectively. Although the R&D shares of these two sectors have grown at a slower pace, they have been more resilient to economic fluctuations.

Greenhouse gas emissions, share of renewable energy in gross final energy consumption, and energy efficiency

By 2015, emissions of greenhouse gases (GHGs) across the EU had fallen by 22.1 % compared with 1990 levels. This represents a slight increase in emissions compared to 2014, when emissions were 22.6 % below 1990 levels. However, the EU is expected to exceed its Europe 2020 target of reducing GHG emissions by 20 % by 2020. All sectors, except fuel combustion in transport and international aviation, contributed to the reductions between 1990 and 2015. Although energy industries were responsible for the largest reductions in absolute terms over this time period, it was still the sector responsible for the largest share of total emissions in 2015.

The EU's GHG emissions per capita are below the levels observed in many other major economies such as Australia, Canada and the United States. Despite large variations of per capita GHG emissions globally, between 1990 and 2013, a trend towards greater convergence can be observed: per-capita emissions have decreased in the EU, in the United States and Australia, while increasing in poorer countries, with the biggest increases taking place in China and South Korea.

The share of renewable energy in gross final energy production, the Europe 2020 strategy's second climate change and energy target, increased from 16.1 % in 2014 to 16.7 % in 2015. Therefore, the EU remains 3.3 percentage points below the Europe 2020 renewable energy target of 20 %. Solid, liquid and gaseous biofuels still provide the biggest share of total renewable energy in the EU, also being the largest renewable energy source used in transport and for heating and cooling. Hydropower remains the dominant renewable energy technology in the electricity sector. However, the shares of wind and solar energy have increased substantially thanks to effective support schemes and large cost reductions. Compared to other economies in the world, in particular most emerging and industrialised countries, the EU's renewable energy share is relatively high.

The EU has also made substantial progress towards its energy efficiency objective. The 2020 target for final energy consumption has already been achieved. With respect to primary energy consumption, the EU must achieve a further reduction of 3.1 % until 2020 to reach the Europe 2020 target of increasing its energy efficiency by 20 % compared with projections. In 2015, the EU consumed 10.7 % less primary energy than in 2005, but 1.4 % more than in 2014. Energy efficiency policies have helped achieve substantial

reductions in primary energy consumption, but some of the reductions can also be attributed to lower economic output and warmer than average years, such as 2013 and 2014. Globally, only one major economy has reduced primary energy consumption more than the EU: Japan consumed 16 % less primary energy in 2015 than it did in 2005.

Early leavers from education and training and tertiary educational attainment

The share of early leavers from education and training, defined as the share of 18 to 24 year olds with at most lower secondary education and not in further education and training, has fallen continuously since 2002, both for men and women. In 2016, the indicator stood at 10.7 %, compared with 11 % in 2015. Thus, Europe is steadily approaching its headline target for 2020, which envisages reducing the rate of early leavers from education and training to less than 10 %.

Young men are more likely to leave education and training early compared to women, even though the gap has been narrowing since 2004. Figures for women are already below the overall EU target, standing at 9.2 % in 2016. Residents not born in the reporting country are more likely to leave formal education early compared to natives.

Early leavers from education and training face particularly severe problems in the labour market. In 2016, about 58 % of 18 to 24 year old early leavers from education and training were either unemployed or inactive. This share has increased by 12 percentage points compared to 2008.

Improvements can also be observed in the share of 30 to 34 year olds who have completed tertiary education, which increased between 2015 and 2016 from 38.7 % to 39.1 %. Provided that this positive trend continues, the EU seems to be on track to meeting its target of increasing that share to at least 40 % by 2020. However, the EU's tertiary attainment rate still lags behind the rates of some other major world economies such as South Korea, Japan, Canada and the United States.

Disaggregated by gender, the data reveal that growth in the share of tertiary graduates has been considerably faster for women, who already met the Europe 2020 target in 2012 and by 2016 reached 43.9 %. Progress has been slower for men: by 2016 only 34.4 % of 30 to 34 year old men have attained tertiary education.

People at risk of poverty or social exclusion

The Europe 2020 strategy aims to reduce the number of people at risk of poverty or social exclusion by 20 million by 2020, as compared with the 2008 level ([1]). The development of risk of poverty or social exclusion in the EU over the past decade has been marked by two turning points: in 2009, when the number of people at risk started to rise because of the delayed social effects of the economic crisis and in 2012, when this upward trend reversed. In 2015, 118.8 million people were affected by poverty or social exclusion in the EU-28, which was around one million more than in 2010, but three million less than in 2014. Although the share of poor or socially excluded people has recently decreased and is approaching the levels observed before the economic crisis in 2008, almost every fourth person (23.7 % of the population) in the EU remained at risk of poverty or social exclusion in 2015, which means that the gap to the EU target was 22.9 million people. Additional efforts would be necessary to further enhance the positive trend in the indicator for poverty and social exclusion and to meet the Europe 2020 goal.

The most widespread form of poverty in the EU is monetary poverty. In 2015, about 86.6 million people, representing 17.3 % of the total EU population, were at risk of poverty after social transfers. The second most common form of

([1]) Due to the structure of the survey on which most of the key social data is based (European Union Statistics on Income and Living Conditions), a large part of the main social indicators available in 2010, when the Europe 2020 Strategy was adopted, referred to 2008 data for the EU-27 as the most recent data available. This is why monitoring of progress towards Europe 2020 headline targets takes EU-27 data from 2008 as a baseline year (see European Commission, *Social Europe — Current challenges and the way forward*, Annual Report of the Social Protection Committee (2012), Luxembourg, Publications Office of the European Union, 2013, p. 12).

poverty was severe material deprivation, affecting almost 40.3 million people or 8.1 % of all EU citizens. The third dimension of poverty and social exclusion covered by the headline indicator 'very low work intensity' affected over 39.6 million people in 2015. This equalled 10.6 % of the total population aged 0 to 59 in the EU. People may be simultaneously affected by two or more forms of poverty, but are only counted once for the headline indicator.

The three dimensions of poverty and social exclusion captured by the headline indicator have developed unevenly since 2010. Monetary poverty has been moderately but steadily increasing and the overall amount of people living in households with very low work intensity has not changed drastically since 2010. At the same time, the amount of materially deprived people first increased from 2009 to 2012, and has decreased since then. Thus, developments in the headline indicator were mainly driven by changes in the number of severely materially deprived people.

Across all three dimensions of poverty, the most vulnerable groups appear to be the same, namely young people, the unemployed and inactive, single parents, households consisting of only one person, people with low educational attainment, foreign citizens born outside the EU and people residing in rural areas. Of all the groups examined, the unemployed and single parents with one or more dependent children faced the highest risk of poverty.

Introduction

1. Providing statistical support to Europe 2020

The 2017 edition of Eurostat's annual 'flagship publication' entitled 'Smarter, greener, more inclusive? — Indicators to support the Europe 2020 strategy' provides statistical support for the Europe 2020 strategy, the EU's agenda for jobs and growth for the current decade, and monitors progress towards its headline targets. The publication presents the most recent official statistics disseminated by Eurostat, with the aim of providing statistical analyses related to important European Commission policy frameworks and relevant economic, social and environmental phenomena. Impartial and objective statistical information is essential for evidence-based political decision-making and defines Eurostat's role in the context of the Europe 2020 strategy ([1]). It involves developing and choosing relevant indicators to support the strategy, producing statistical data and assuring the indicators' quality.

The analysis in the five thematic chapters is based on the Europe 2020 headline indicators developed to monitor the strategy's targets. Other indicators focusing on specific subgroups of society or on related issues that show underlying trends are also used to deepen the analysis and present a broader picture. The data used mainly come from official ESS sources such as the EU Labour Force Survey (EU LFS) or the EU Statistics on Income and Living Conditions (EU SILC), as well as from administrative sources. Data on EU-28 aggregates and individual Member States are presented and, where available, comparisons are made with the members of the European Free Trade Association (EFTA) and candidate countries, as well as non-European countries such as the United States and Japan. For some of the headline indicators, maps presenting the performance of Europe's regions and their progress towards the national Europe 2020 targets are included, even though the targets only apply on a national level.

The thematic chapters analyse past trends, generally since 2002 or 2008, up to the most recent year for which data are available (2015 or 2016). They aim to document and analyse the trends shown by the headline indicators and the distance to the Europe 2020 targets, while also using supplementary indicators to provide the broader context. The chapters include references to analyses published by the European Commission on the future efforts required to meet the targets. Most recent data on the headline indicators and information on the Europe 2020 strategy are available on a dedicated section of Eurostat's website: Europe 2020 headline indicators ([2]).

([1]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels, 2010.
([2]) See: http://ec.europa.eu/eurostat/web/europe-2020-indicators/europe-2020-strategy/headline-indicators-scoreboard

2. The Europe 2020 strategy

The Europe 2020 strategy was adopted by the European Council on 17 June 2010 ([3]) as the successor to the Lisbon strategy. It emphasises smart, sustainable and inclusive growth as a way of strengthening the EU economy and preparing its structure for the challenges of the next decade.

2.1 Three key priorities and eight targets

The Europe 2020 strategy puts forward three mutually reinforcing priorities to make Europe a smarter, more sustainable and more inclusive place to live:

- Smart growth, through the development of an economy based on knowledge, research and innovation.
- Sustainable growth, through the promotion of resource-efficient, green and competitive markets.
- Inclusive growth, through policies aimed at fostering job creation and poverty reduction.

In a rapidly changing world, these priorities are deemed essential for making the European economy fit for the future and for delivering higher employment, productivity and social cohesion ([4]). Under the three key priorities, the EU adopted eight targets (see Figure 0.1):

- Smart growth: covered by the target on R&D and two targets on education
- Sustainable growth: covered by three targets on climate change and energy
- Inclusive growth: covered by the targets on employment and on poverty and social exclusion.

The targets are monitored using a set of nine headline indicators and additional sub-indicators related to various dimensions of the data (such as the multidimensional concept of poverty and social exclusion). For a detailed overview of the indicators, see Table 0.1 in the Executive summary. The strategy's objectives and targets are further

Figure 0.1: The Europe 2020 strategy's key priorities, headline targets and flagship initiatives

	Targets	Flagship initiatives
Smart growth	• Increasing combined public and private investment in R&D to 3 % of GDP • Reducing school drop-out rates to less than 10 % • Increasing the share of the population aged 30–34 having completed tertiary education to at least 40 %	• Innovation Union • Youth on the move (ended in December 2014) • A digital agenda for Europe
Sustainable growth	• Reducing greenhouse gas emissions by at least 20 % compared to 1990 levels • Increasing the share of renewable energy in final energy consumption to 20 % • Moving towards a 20% increase in energy efficiency	• Resource efficient Europe • An industrial policy for the globalisation era
Inclusive growth	• Increasing the employment rate of the population aged 20–64 to at least 75 % • Lifting at least 20 million people out of the risk of poverty and social exclusion	• An agenda for new skills and jobs • European platform against poverty and social exclusion

([3]) European Council conclusions, 17 June 2010, EUCO 13/10, Brussels, 2010.
([4]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM (2010)2020 final, Brussels, 2010.

supported by thematic flagship initiatives (see Figure 0.1).

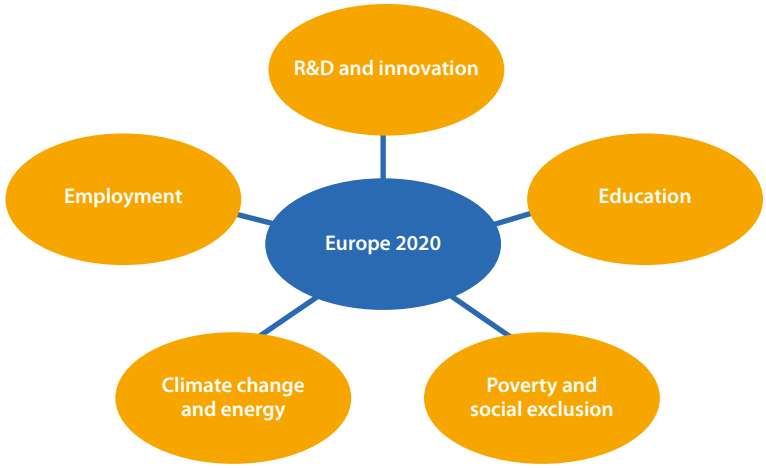
The eight targets belong to five thematic areas: employment, education, poverty and social exclusion, climate change and energy, and R&D and innovation (see Figure 0.2). These five areas are strongly interlinked. For example, higher educational levels are associated with improved employability and increasing the employment rate helps to reduce poverty. A greater capacity for R&D and innovation across all sectors of the economy, combined with increased resource efficiency, would improve competitiveness and foster job creation. Investing in cleaner, low-carbon technologies would help the environment, contribute to the fight against climate change and create new business and employment opportunities ([5]).

The EU targets have been translated into national targets. These reflect each Member State's situation and the level of ambition they are able to reach as part of the EU-wide effort for implementing the Europe 2020 strategy. However, not in all cases are the national targets sufficiently ambitious to cumulatively reach the EU-level targets. For instance, the fulfilment of all national targets in the area of employment would bring the overall EU-28 employment rate up to 74 %, which would still be one percentage point below the Europe 2020 target of 75 %. Similarly, even if all Member States met their national targets on R&D expenditure, the EU would still fall short of its target of 3 % R&D intensity, reaching only 2.6 % by 2020 ([6]).

2.2 Seven flagship initiatives

To ensure progress towards the Europe 2020 goals, a broad range of existing EU policies and instruments are used, including the single market, the EU budget and external policy tools. The ten priorities of the Commission ([7]) (see section '3.3 Ten priorities for the EU') guide the EU policies and help ensure progress towards smart, sustainable and inclusive growth. The strategy itself identified seven policy areas where jobs and growth were put forward through the following seven flagship initiatives ([8]): 'Innovation Union', 'Youth on the move' ([9]), 'Digital agenda for Europe',

Figure 0.2: Europe 2020 strategy thematic areas



([5]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels, 2010 (p. 11).
([6]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, Brussels (p. 12–16).
([7]) Jean-Claude Juncker, *A New Start for Europe: My Agenda for Jobs, Growth Fairness and Democratic Change*, Strasbourg, 15 July 2015.
([8]) For more information on the flagship initiatives see the Europe 2020 website: http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/flagship-initiatives/index_en.htm
([9]) The 'Youth on the move' flagship initiative ended in December 2014.

'Resource efficient Europe' ([10]), 'An industrial policy for the globalisation era', 'Agenda for new skills and jobs' and 'European platform against poverty and social exclusion'.

2.3 Taking stock of Europe 2020 — how to pursue smart, sustainable and inclusive growth?

In March 2014, the Commission published a Communication 'Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth' ([11]). The mid-term evaluation revealed that progress towards the Europe 2020 targets and flagship initiatives had been mixed: while the EU was on course to meet its targets on education, climate and energy, it was still far from fulfilling the employment, research and development, and poverty reduction targets ([12]).

Between May and October 2014, the Commission held a public consultation seeking stakeholders' views on the lessons to be learned from the first years of the strategy's implementation. The main conclusions drawn from the public consultation ([13]), published in 2015, were:

- 'Europe 2020 is seen as a relevant overarching framework to promote jobs and growth at EU and national level. Its objectives and priorities are meaningful in the light of current and future challenges.
- 'The five headline targets represent key catalysts for jobs and growth and help to keep the strategy focused.
- 'Most of the flagship initiatives have served their purpose, yet their visibility has remained weak.
- There is scope and a need to improve the delivery of the strategy through enhanced ownership and involvement on the ground' ([14]).

In the 2016 Annual Growth Survey ([15]), the Commission stated that it will make the best use of the Europe 2020 strategy and its tools by improving its implementation and monitoring in the context of the European Semester.

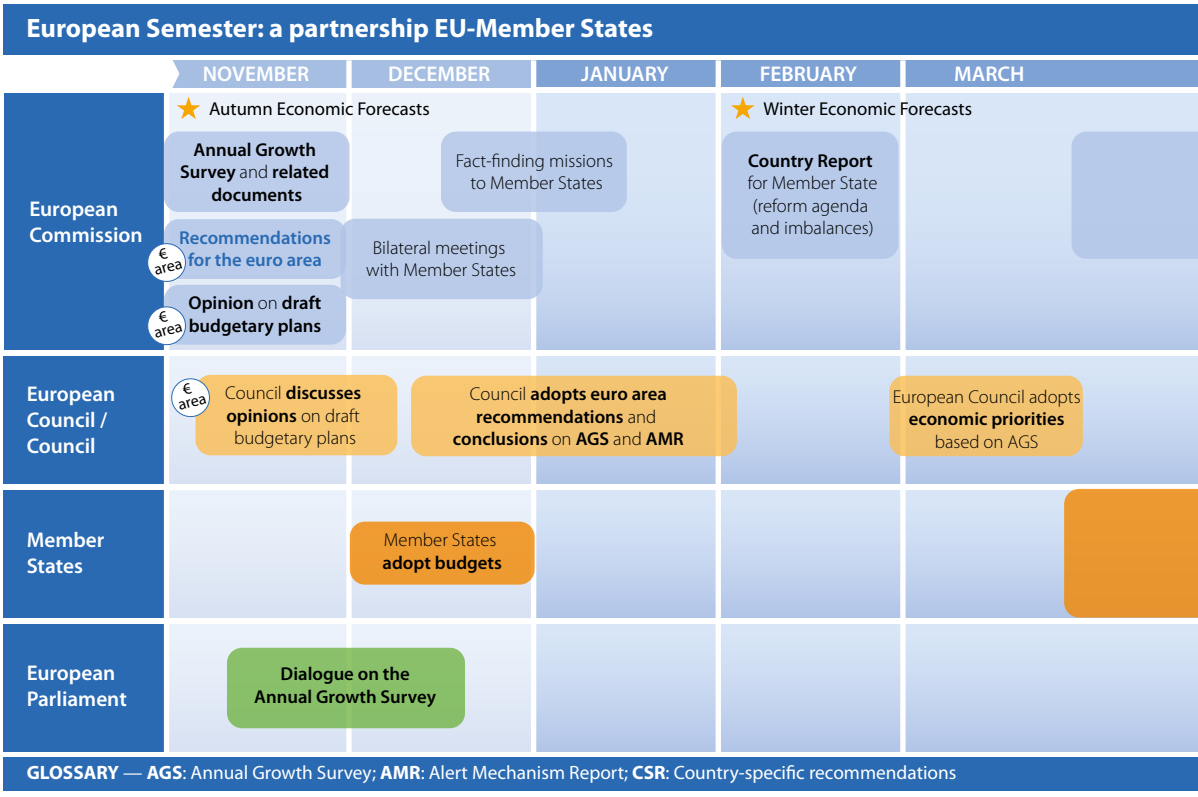
In the 2017 Annual Growth Survey ([16]), the Commission called on Member States to redouble their efforts along the so-called virtuous triangle of economic policy: boosting investment, pursuing structural reforms and ensuring responsible fiscal policies. Emphasis was placed on the importance of ensuring social fairness to deliver more inclusive growth, as well as on the need to strengthen competitiveness, innovation and productivity.

2.4 The European Semester: annual cycle of policy coordination

The success of the Europe 2020 strategy crucially depends on Member States coordinating their efforts. To ensure this, the European Commission has set up an annual cycle of coordination of economic policies known as the European Semester. Its main purpose is to foster structural reforms, to create more jobs and growth in line with the Europe 2020 strategy, to boost investment, to ensure sound public finances (avoiding excessive government debt) and compliance with the Stability and Growth Pact (SGP) ([17]) and to prevent excessive macroeconomic imbalances in the EU.

([10]) The Resource Efficiency Scoreboard, comprising about 30 indicators, is disseminated via a dedicated section on Eurostat's website.
([11]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, Brussels.
([12]) Id., p. 21.
([13]) European Commission, *Results of the public consultation on the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2015) 100 final, Brussels, 2015.
([14]) Ibid.
([15]) European Commission, *2016 European Semester: Annual Growth Survey*, COM(2015) 690 final, Brussels.
([16]) European Commission, *2017 European Semester: Annual Growth Survey*, COM(2016) 725 final, Brussels.
([17]) For more information on the Stability and Growth Pact see: https://ec.europa.eu/info/node/4287/

Figure 0.3: The European Semester

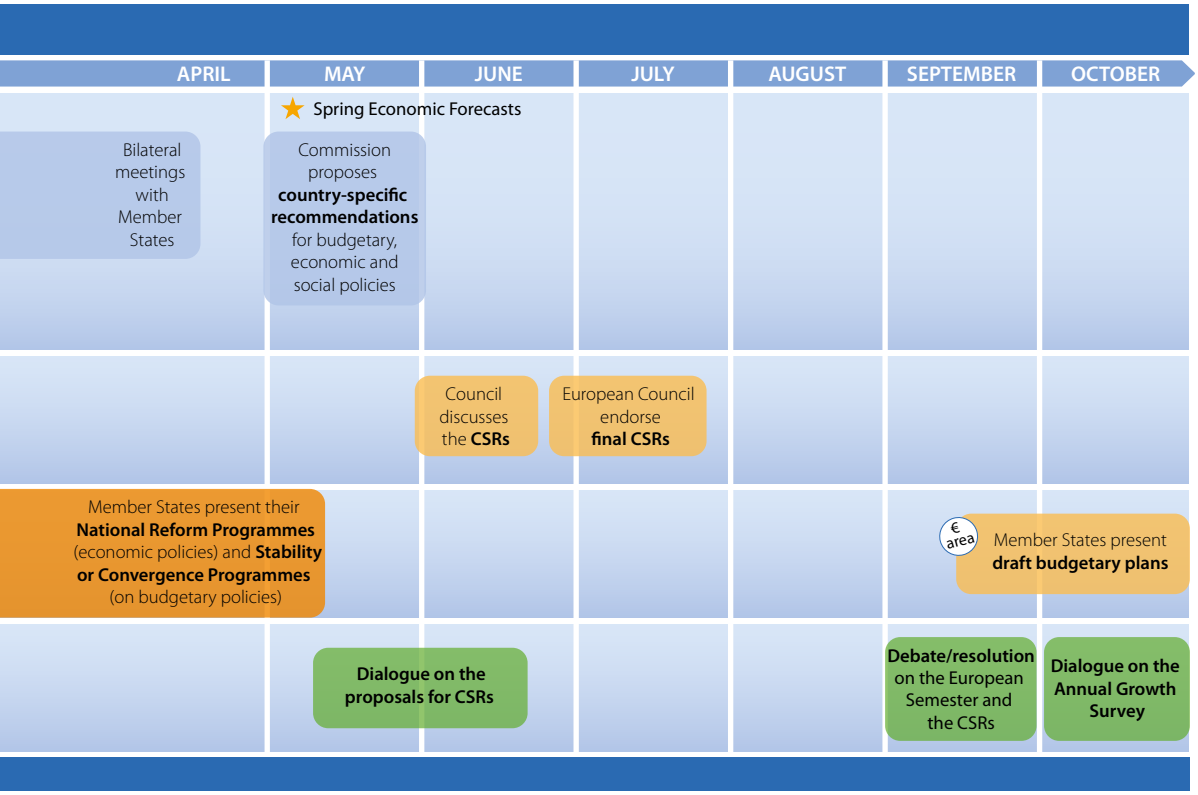


Source: European Commission

Figure 0.3 presents the different steps of the European Semester policy cycle. These include:

- Adoption of the Annual Growth Survey (AGS) ([18]) by the European Commission, which sets out overall economic and social priorities for the EU and its Member States.
- Publication of the Commission's Alert Mechanism Report (AMR) ([19]), the draft Joint Employment Report ([20]) and recommendations for the euro area ([21]), accompanied by a Staff Working Document.
- Publication of a **country report** by the Commission services for each Member State, analysing its economic and social situation and progress with implementing the country-specific recommendations and progress towards the Europe 2020 strategy. For the Member States selected in the Alert Mechanism

([18]) For more information on the Annual Growth Survey see: https://ec.europa.eu/info/publications/2017-european-semester-annual-growth-survey_en
([19]) For more information on the Alert Mechanism report see: https://ec.europa.eu/info/publications/2017-european-semester-alert-mechanism-report_en
([20]) For more information on the Draft Joint Employment Report see: https://ec.europa.eu/info/publications/2017-european-semester-draft-joint-employment-report_en
([21]) For more information on the 2017 Recommendation for the Euro Area see: https://ec.europa.eu/info/publications/2017-european-semester-recommendation-euro-area_en



Report, it also includes the '**in-depth review'** of possible imbalances.

- Submission of the National Reform Programmes (NRPs) and Stability and Convergence Programmes (SCPs) ([22]) by each Member State, presenting concrete reforms and measures towards implementing the **country-specific recommendations** and the Europe 2020 strategy.
- Adoption of the proposals for country-specific recommendations for each Member State (except those under a stability support programme) by the Commission, followed by a formal Council endorsement of the country-specific recommendations. The recommendations focus on the issues which require the most urgent attention in the next 12 to 18 months due to their macro-and socioeconomic significance. They are consistent with the Europe 2020 strategy.

([22]) For more information on the National Reform Programmes and Stability and Convergence Programmes see: https://ec.europa.eu/info/strategy/european-semester/european-semester-timeline/national-reform-programmes-and-stability-convergence-programmes_en

3 Europe 2020 in a broader policy perspective

3.1 Strengthening economic governance

To ensure progress towards the Europe 2020 goals, a broad range of existing EU policies and instruments are used, including the single market, the EU budget and external policy tools. Central to tackling the weaknesses revealed by the economic crisis and to achieving the Europe 2020 objectives of growth and competitiveness is the promotion of enhanced economic governance. On top of and closely linked to the European Semester, two important elements in this respect are the Macroeconomic Imbalances Procedure (MIP) ([23])([24]) and the Excessive Deficit Procedure (EDP) ([25]) based on the Stability and Growth Pact.

In June 2015, the President of the European Commission, in close cooperation with the President of the Euro Summit, the President of the Eurogroup, the President of the European Central Bank, and the President of the European Parliament, presented a report titled 'Completing Europe's Economic and Monetary Union' ([26]), also known as the Five Presidents' Report ([27]). It proposed a roadmap for strengthening the Economic and Monetary Union (EMU) by taking actions on four fronts: economic, financial, fiscal and political. As laid out in the roadmap, a number of immediate steps should be taken by mid-2017. The roadmap supports the implementation of the Europe 2020 strategy by proposing concrete steps towards 'job creation, growth and prosperity for all citizens'.

As a follow-up to the Five President's report, the European Commission issued a Communication 'On steps towards completing the Economic and Monetary Union' ([28]). It laid out a plan for strengthening the European Semester by better integrating European and national dimensions, placing a stronger focus on employment and social performance, promoting convergence by benchmarking and pursuing best practices, as well as by supporting structural reforms through the provision of EU funds and technical assistance.

At the start of the 2017 annual cycle of the European Semester, together with the 'Recommendation on the economic policy of the euro area for 2017–2018' ([29]) the Commission issued a Communication 'Towards a positive fiscal stance for the euro area' ([30]). This sets out the case for a more expansionary fiscal policy for the euro area at this point in time to support the ongoing recovery and overcome the risk of a 'low growth, low inflation' situation. It emphasises that the quality and composition of public finances as well as the very different situations of Member States in terms of fiscal space or consolidation needs should be taken into account when designing a growth-friendly fiscal policy. In particular, Member States in the excessive deficit procedure and others still needing to progress towards their medium-term budgetary objective should continue to do so, whereas Member States with fiscal space should be encouraged to carry out a more expansionary fiscal policy.

([23]) An MIP scoreboard of 14 indicators provides information for the identification of external and internal macroeconomic imbalances.
([24]) For more information on the Macroeconomic Imbalance Procedure see the dedicated Statistics Explained page: http://ec.europa.eu/eurostat/statistics-explained/index.php/The_Macroeconomic_Imbalance_Procedure_(MIP)_introduced
([25]) An overview of the current situation concerning the ongoing excessive deficit procedures, as well as documentation on the closed procedures can be found on the Europe 2020 dedicated website: https://ec.europa.eu/info/strategy/european-semester_en
([26]) European Commission, *The Five Presidents' Report: Completing Europe's Economic and Monetary Union*, 22 June 2015.
([27]) The report was prepared by the president of the European Commission, in close cooperation with the presidents of the Euro Summit, the Eurogroup, the European Central Bank and the European Parliament.
([28]) European Commission, *Communication from the Commission to the European Parliament, the Council and the European Central Bank on steps towards Completing Economic and Monetary Union*, COM(2015) 600 final, Brussels, 2015.
([29]) European Commission, *Recommendation for a Council Recommendation on the economic policy of the euro area*, COM(2016) 726 final, Brussels, 2016.
([30]) European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions towards a positive fiscal stance for the euro area*, COM(2016) 727 final, Brussels, 2016.

On 31 May 2017, as a follow-up to the White Paper on the future of Europe of 1 March 2017, the Commission adopted a Reflection Paper on the deepening of the Economic and Monetary Union ([31]). This document includes avenues to reinforce further the European Semester.

3.2 The 2030 Agenda for sustainable development

The Europe 2020 strategy gives recognition to the economic, social and environmental dimensions of sustainable development by drawing attention to education, research and development and innovation, low carbon emissions, climate resilience and environmental impact, and job creation and poverty reduction. In a broader policy perspective, the Europe 2020 strategy plays an important role in addressing the internationally adopted 2030 Agenda for Sustainable Development and thus putting the European Union on the right track to achieving a sustainable future.

Box 0.1: The Sustainable Development Goals

Goal 1. End poverty in all its forms everywhere

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3. Ensure healthy lives and promote well-being for all at all ages

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5. Achieve gender equality and empower all women and girls

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

Goal 10. Reduce inequality within and among countries

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12. Ensure sustainable consumption and production patterns

Goal 13. Take urgent action to combat climate change and its impacts*

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17. Strengthen the means of implementation and revitalise the global partnership for sustainable development

* Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

([31]) European Commission, *Reflection Paper on the deepening of the Economic and Monetary Union*, COM/2017/0291 final, Brussels, 2017.

The 2030 Agenda was formally adopted by world leaders at the United Nations Sustainable Development Summit in September 2015. The document, titled 'Transforming our world: the 2030 agenda for sustainable development' ([32]), consists of a declaration, a set of 17 Sustainable Development Goals (SDGs; see Box 0.1 for a full list) and 169 related targets, a section on the means of implementation and on the follow-up and review of the 2030 Agenda. The EU was instrumental in shaping the global 2030 Agenda, which is fully consistent with Europe's vision and has now become the world's blueprint for global sustainable development.

In March 2017, at its 48th session, the United Nations Statistical Commission (UNSC) adopted a global indicator framework for monitoring progress towards the SDGs. The global list consists of 244 indicators to measure progress towards the 169 targets of the SDGs. In November 2016, the European Commission released the Communication 'Next steps for a sustainable European future: European action for sustainability' ([33]), outlining its approach to achieving the 2030 Agenda. It presents the EU's answer to the 2030 Agenda and includes two work streams. The first work stream is to fully integrate the SDGs in the European policy framework and current Commission priorities, assessing where we stand and identifying the most relevant sustainability concerns. A second track is related to reflection work on further developing the EU's longer term vision and the focus of sectoral policies after 2020, preparing for the long-term implementation of the SDGs.

Eurostat has been leading the process of developing a reference indicator framework for monitoring the Sustainable Development Goals in an EU context. To achieve this, it has been working closely with European Commission Directorate Generals and with the consultation of Commission services and experts from Member States' national statistical institutes. Several bodies have been consulted, including Council Committees, the

Box 0.2: The ten European Commission priorities

1. A new boost for jobs, growth and investment ([34])
2. A connected digital single market ([35])
3. A resilient Energy Union with a forward-looking climate change policy ([36])
4. A deeper and fairer internal market with a strengthened industrial base ([37])
5. A deeper and fairer Economic and Monetary Union (EMU) ([38])
6. A reasonable and balanced free trade agreement with the United States ([39])
7. An area of justice and fundamental rights based on mutual trust ([40])
8. Towards a new policy on migration ([41])
9. Europe as a stronger global actor ([42])
10. A Union of democratic change ([43])

([32]) United Nations, *Transforming our World: the 2030 agenda for sustainable development*, A/RES/70/1, 25 September 2015.
([33]) European Commission, *Next steps for a sustainable European future: European action for sustainability*, COM(2016) 739, Brussels, 2016.
([34]) For more information on the investment plan see: http://ec.europa.eu/priorities/jobs-growth-and-investment_en
([35]) For more information on the digital single market see: https://ec.europa.eu/priorities/digital-single-market_en
([36]) For more information on the energy union see: http://ec.europa.eu/priorities/energy-union-and-climate_en
([37]) For more information on the internal market see: http://ec.europa.eu/priorities/internal-market_en
([38]) For more information on the Economic and Monetary union see: https://ec.europa.eu/commission/priorities/deeper-and-fairer-economic-and-monetary-union_en
([39]) For more information on the EU-US free trade agreement see: http://ec.europa.eu/priorities/balanced-eu-us-free-trade-agreement_en
([40]) For more information on justice and fundamental rights see: http://ec.europa.eu/priorities/justice-and-fundamental-rights_en
([41]) For more information on migration policy see: http://ec.europa.eu/priorities/migration_en
([42]) For more information on the EU as a stronger global actor see: https://ec.europa.eu/priorities/stronger-global-actor_en
([43]) For more information on making the EU more democratic see: https://ec.europa.eu/priorities/democratic-change_en

European Statistical Advisory Committee (ESAC), non-governmental organisations, academia and other international organisations.

The EU SDG indicator set received a favourable opinion by the European Statistical System Committee in May 2017. The list comprises 100 indicators, structured along the 17 SDGs and covering the social, economic, environmental and institutional dimensions of sustainability as represented by the Agenda 2030. Each SDG is presented through a set of five to six indicators reflecting its broad objective and ambition, and additional multi-purpose indicators to track two or more targets across goals. The indicator set looks at how the EU policies contribute to the implementation of the 2030 Agenda. In this respect, it complements from an EU perspective the UN global indicators, which refer instead to the goals and targets as specified in the 2030 Agenda. Although the EU SDG indicator set has been aligned as far as appropriate with the UN list of global indicators, it does not intend to cover all aspects of the SDGs or to fully reproduce the UN global list. Instead, it includes indicators relevant to the EU which allow SDGs to be monitored in the context of long-term EU policies, such as the Europe 2020 strategy, the 10 Commission priorities, the Circular Economy Package or other policies or initiatives reported in the staff working document 'Key European action supporting the 2030 Agenda and the Sustainable Development' ([44]).

For more information on the SDGs, both on the process at UN level as well as from the European perspective, please refer to the Eurostat publication 'Sustainable development in the European Union — A statistical glance from the viewpoint of the UN Sustainable Development Goals' ([45]), as well as to the forthcoming first edition of the Eurostat EU SDG monitoring report, based on the approved EU SDG indicator list.

3.3 Ten priorities for the EU

Before being elected president of the European Commission in July 2014, Jean-Claude Juncker presented his political agenda, highlighting ten priority areas, in a document entitled 'A New Start for Europe: My Agenda for Jobs, Growth Fairness and Democratic Change' ([46]) (see Box 0.2). These are referred to as 'political guidelines' for the European Commission and address some of the key challenges facing the European economy and society. Emphasis is placed on achieving concrete results in the identified priority areas whereas other policy areas are left to Member States who are considered better equipped to form effective policy responses at national, regional and local level.

In September 2016, the Commission released a report on Progress on the European Commission's 10 Priorities ([47]). As outlined in the document, in its first year the investment plan for jobs and growth, which has the ambition to mobilise at least EUR 315 billion for investment over three years, has raised EUR 116 billion in new investments across 26 of the EU Member States. Since its first year in office, the European Commission has been working on the Energy Union, the Digital Single Market and a Capital Markets Union, among others. Important progress in further cutting mobile roaming charges and adopting new EU data protection rules was made in 2016. A roadmap for deepening the Economic and Monetary Union was presented in the Five Presidents' Report (European Commission, 2015). The Commission has worked towards a coordinated European response to the challenges of increased movement of migrants and refugees and has supported most affected Member States with a financial assistance of EUR 91 million under the national programmes for the period 2014–2020. The EU has also taken actions for responding to the terrorist threat, strengthening EU's external borders and tackling radicalisation through the creation

([44]) Commission Staff Working Document, *Key European action supporting the 2030 Agenda and the Sustainable Development Goals*, SWD(2016) 390 final, Brussels, 2016.
([45]) Eurostat, *Sustainable development in the European Union — A statistical glance from the viewpoint of the UN Sustainable Development Goals*, Luxembourg, Publications Office of the European Union, 2016.
([46]) Jean-Claude Juncker, *A New Start for Europe: My Agenda for Jobs, Growth Fairness and Democratic Change*, Strasbourg, 15 July 2015.
([47]) European Commission, *State of the Union 2016: Towards a better Europe— A Europe that protects, empowers and defends*, 2016.

of the new European Boarder and Coast Guard, Europol's new European Counter-Terrorism Centre and the Radicalisation Awareness Network's Centre of Excellence, to name a few examples.

3.4 White Paper on the future of Europe

At the Rome Summit on 1 March 2017 the Commission presented a White Paper ([48]), setting out a broader vision for the future of the EU and the Economic and Monetary Union (EMU). The White Paper outlines the main demographic, economic and political challenges the EU will be facing in the future and presents five scenarios of the potential state of the Union in 2025.

- **Scenario 1**: Carrying On — The EU-27 'focuses on delivering its positive reform agenda' in the spirit of the Juncker Commission's New Start for Europe from 2014 and the Bratislava Declaration from 2016 ([49]).
- **Scenario 2**: Nothing but the Single Market — The EU-27 is 'gradually re-centred on the single market' as Member States are not able to find common ground on many policy areas.
- **Scenario 3**: Those Who Want More, Do More — The EU-27 proceeds as today, but in addition it 'allows willing Member States to do more together in specific areas' such as defence, internal security, taxation or social matters.
- **Scenario 4**: Doing Less, More Efficiently — The EU-27 'focuses on delivering more and faster in selected policy areas, while doing less' where it is perceived to have more limited added value.
- **Scenario 5**: Doing Much More Together — 'Member States decide to share more power, resources and decision-making across the board'.

The White Paper aims to open an honest debate on how the Union should evolve in the years to come. To facilitate this process, the European Commission will host a series of 'Future of Europe Debates' across Europe's cities and regions to harness opinions of citizens on the desired way forward and will further contribute to the discussions with a series of reflection papers. This process allow a collective view on a course of action to be reached in time for the European Parliament elections in June 2019.

The White Paper has been supplemented by five reflection papers on specific issues that are important for the future of the European Union with 27 Member States — the social dimension of Europe, harnessing globalisation, the deepening of the economic and monetary union, the future of European defence and the future of EU finances.

([48]) European Commission, *White Paper on the future of Europe. Reflections and scenarios for the EU27 by 2015*, COM(2017) 2025, Brussels, 2017.
([49]) *The Bratislava Declaration*, Bratislava, 16 September, 2016.

1 Employment

1.1 Employment — why does it matter?

Employment and other labour market-related issues are at the heart of social and political debate in the EU. Paid employment is crucial for ensuring sufficient living standards and it provides the necessary foundation for people to achieve their personal goals and aspirations. Moreover, employment contributes to economic performance, quality of life and social inclusion, making it a cornerstone of socioeconomic development and well-being.

The EU's labour force is shrinking as a result of demographic changes that have led to a greater share of older people than younger people in the population. Because of these changes, a smaller number of workers are now supporting a growing number of dependent people, putting the sustainability of Europe's social model, welfare systems, economic growth and public finances at risk. In addition, the economic crisis exposed structural weaknesses in the EU's economy. At the same time, global challenges are intensifying and competition from developed and emerging economies such as China and India is increasing ([1]).

To face the challenges of an ageing population and rising global competition, the EU needs to make full use of its labour potential. The Europe 2020 strategy, through its 'inclusive growth' priority, places a strong emphasis on job creation. One of its five headline targets addresses employment, with the aim of raising the employment rate of 20 to 64 year olds to 75 % by 2020. This goal is supported by the so-called 'Employment Package' ([2]), which seeks to create more and better jobs throughout the EU.

The EU's employment target is closely interlinked with the other strategy goals on research and development (R&D) (see the chapter on 'R&D and innovation', page 55), education (see the chapter on 'Education', page 107) and poverty and social exclusion (see the chapter on 'Poverty and social exclusion', page 129). Better educational levels increase employability and higher employment rates can in turn contribute to economic performance and poverty alleviation, thus addressing the strategy's inclusive growth objective. Moreover, boosting R&D capacity and innovation could improve competitiveness and thus contribute to job creation.

Europe 2020 strategy target on employment

The Europe 2020 strategy sets out a target of 'increasing the employment rate of the population aged 20 to 64 to at least 75 %' by 2020 ([3]).

This chapter analyses progress towards the EU's employment target, which is monitored through the headline indicator 'Employment rate — age group 20 to 64'. This is complemented by contextual indicators on the characteristics of the labour force and on employment and unemployment trends. The analysis looks into the structure of the EU's labour force and its long-term influence on employment in relation to the strategy's main target groups such as young, older, low-skilled workers, women and migrants. The chapter also covers short-term factors related to the economy's cyclical development (represented by GDP growth) such as employment growth of different economic sectors, non-standard work contracts and youth unemployment. Finally, the analysis investigates inefficiencies in the labour market by examining over-qualification rates, labour force and employment trends by educational attainment, job vacancy rate and long-term unemployment.

([1]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels, 2010 (p. 5, 7, 17); European Commission, *An Agenda for new skills and jobs: A European contribution towards full employment*, COM(2010) 682 final, Strasbourg, 2010 (p. 2).
([2]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012.
([3]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final.

Employment in the EU

Employment rate, age group 20–64

rose from 70.3 % in 2008 to 71.1 % in 2016

2020 target: 75 %

see page 30

... by degree of urbanisation
2016, %

Cities	Rural areas
71.1	70.8

see page 33

... by age
age group 20–29, %

2008	2016
65.6	62.6

see page 33

Gender employment gap
percentage points

2008	2016
15.0	11.5

see page 36

... by educational attainment
lower secondary education at most, %

2007	2016
56.9	53.6

see page 38

... by citizenship
non-EU country, %

2008	2016
62.5	56.6

see page 39

Population age structure
2016, % of population

0–19	20–64	65–79	80+
20.9	59.9	13.8	5.4

see page 41

Old-age-dependency ratio

2002	2016
23.9	29.3

see page 42

Newly employed persons
% of total employment

2016
13.9

see page 43

Employment growth by sector, 2008–2016, %

Construction	Professional, scientific and technical activities
- 19.7	18.8

see page 44

Involuntary temporary employees, age group 20–64
% of employees

2016
8.7

see page 44

Involuntary part-time employment, age group 20–64
% of employment

2008	2016
4.4	5.4

see page 45

Unemployment rate
age group 15–24, %

2002	2016
18.1	18.7

see page 46

Overqualification rate (1)
%

2008	2016
4.7	4.8

see page 48

Job vacancy rate

2008	2016
1.6	1.7

see page 51

Long-term unemployment rate, % of the active population

2008	2016
2.6	4.0

see page 52

(1) Share of people with at least upper secondary education working in elementary occupations.

'Activity', 'employment', 'unemployment' and 'labour force' — main definitions

People are classified as employed, unemployed and economically inactive according to the definitions of the ILO ([4]). On the EU level, the two main sources for the respective data are the EU Labour Force Survey (EU LFS) ([5]) and National Accounts (including GDP) ([6]).

The EU LFS is a large sample survey of private households, excluding the population living in institutional households (such as workers' homes or prisons). The survey classifies respondents as **employed**, **unemployed** or **economically inactive** based on information collected through the survey questionnaire, relating mainly to their activity during a reference week. The EU LFS data refer to the resident population, so the results relate to the country of residence of people in employment, rather than to their country of work ([7]).

'**Labour force**' refers to the economically active population. This is the total number of employed and unemployed people. **Persons in employment** are those who, during the reference week, did any work for pay or profit, or were not working but had a job from which they were temporarily absent. The term 'work' is defined as any work for pay or profit during the reference week, even for as little as one hour. Pay includes cash payments or payment in kind (payment in goods or services rather than money), regardless of whether or not payment was received in the week the work was done. Anyone who receives a wage for on-the-job training that involves the production of goods or services is counted as being in employment. Self-employed and family workers are also included.

Employment rates represent share of employed persons in the total population in the same age group and are typically published for the age group 15 to 64 years. However, in a majority of Member States it is rare to attain secondary education while working, even part-time. Therefore, 15 to 19 year olds who are still in education or training are in the main not seeking employment. Students that attain higher levels of education tend to enter the labour market later. This is in line with the strategy's headline targets on education that promote further education (see the chapter on 'Education', page 107). As a result, the lower age limit of the Europe 2020 strategy's employment target has been raised to 20 years ([8]). The upper age limit for the employment rate is usually set to 64 years, taking into account statutory retirement ages across Europe ([9]).

Unemployed persons comprise people aged 15 to 74 ([10]) who were:

1. Without work during the reference week, meaning they neither had a job nor were at work (for one hour or more) in paid employment or self-employment.
2. Available to start work, meaning they were available for paid employment or self-employment before the end of the two weeks following the reference week.
3. Actively seeking work, meaning they had taken concrete steps in the four-week period ending with the reference week to seek paid employment or self-employment or who found a job to start within at most three months.

The **unemployment rate** is the number of unemployed persons as a percentage of the labour force representing the total number of people who are employed and unemployed.

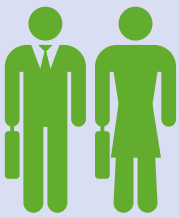
([4]) For more information see the ILO website: http://www.ilo.org/global/lang--en/index.htm
([5]) For more information on the EU LFS, see: http://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey
([6]) For more information see: http://ec.europa.eu/eurostat/web/national-accounts
([7]) This difference may be significant in countries with large cross-border flows.
([8]) João Medeiros & Paul Minty, *Analytical support in the setting of EU employment rate targets for 2020*, Working Paper 1/2012, European Commission (Directorate-General for Employment, Social Affairs & Inclusion), Brussels, 2012 (p. 12).
([9]) European Commission (Directorate-General for Economic and Financial Affairs), *The 2012 Ageing Report: Economic and budgetary projections for the EU27 Member States (2010–2060)*, 2012 (p. 99).
([10]) To take into account people that would like to (or have to) work after the age of 64 but are unable to find a job, the upper age limit for the unemployment rate is usually set to 74. As a result, the observed age group for unemployed persons is 15 to 74 years.

The **youth unemployment rate** is the unemployment rate of people aged 15 to 24; for the purpose of this chapter the analysis is extended to 15 to 29 year olds, which is the age group addressed by the EU Youth Strategy. In contrast, the **youth unemployment ratio** is the percentage of unemployed young people compared to the total population of that age group (not only the active, but also the inactive such as students).

The **long-term unemployment rate** is the number of people unemployed for 12 months or longer as a percentage of the labour force.

The **economically active** population is the sum of employed and unemployed persons. In contrast, **inactive persons** are those who, during the reference week, were neither employed nor unemployed. The **activity rate** is the share of the population that is economically active. The earliest age that a person can leave full-time compulsory education in the EU is 15 ([11]) and in many EU Member States this is also the minimum employment age ([12]). Therefore, activity rate measures the economic activity of people aged 15 years or older.

1.2 EU employment on the rise again — signs of gradual recovery



In 2015 the employment rate in the EU reached 71.1 %. As a result, the distance to the Europe 2020 employment target of 75 % narrowed to 3.9 percentage points.

In 2016, seven Member States — Lithuania, Germany, the Czech Republic, Sweden, Ireland, Estonia and Latvia — had already met their respective national employment targets.

Employment rates across the EU tend to show a north–south divide on a country as well as a regional level. Some of the best performing countries such as Germany, Sweden and the United Kingdom also record high regional employment rates.

In Scandinavian and western European countries employment rates tend to be higher in rural areas. Whereas in most Baltic, southern, central or eastern Member States cities exhibit higher employment rates.

Considerably lower employment rates are observed for women than men. The gender employment gaps are widest for women in age groups associated with having caring responsibilities for children, dependent family members or grandchildren.

People with low educational attainment form one of the most disadvantaged groups in the labour market, exhibiting low employment rates.

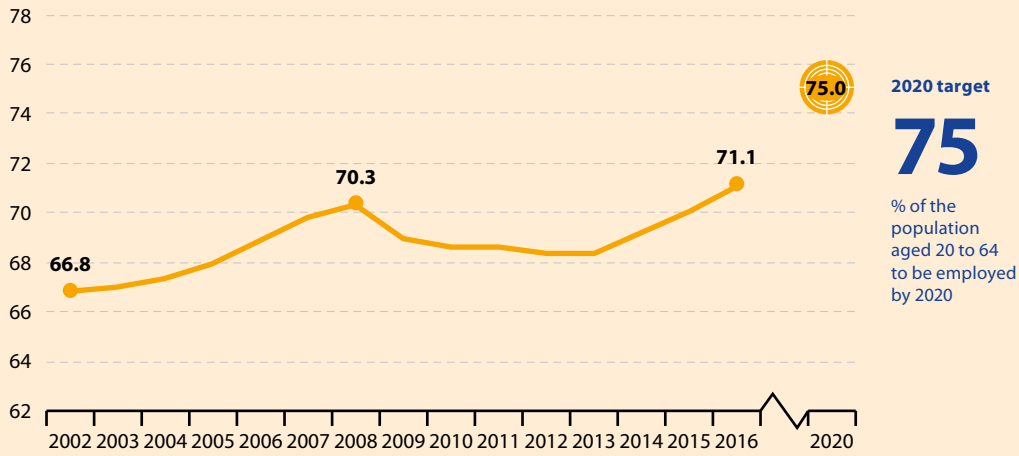
Educational attainment levels and knowledge of their host country's language have a strong influence on how well non-EU citizens integrate into the labour market. People who migrated to the EU to join their families or for international protection are among the most disadvantaged groups in the labour market.

([11]) João Medeiros & Paul Minty, *Analytical support in the setting of EU employment rate targets for 2020*, Working Paper 1/2012, European Commission (Directorate-General for Employment, Social Affairs & Inclusion), Brussels, 2012 (p. 58).
([12]) European Commission (Directorate-General for Justice), *Age and Employment*, Publications Office of the European Union, Luxembourg, 2011 (p. 50).

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

Figure 1.1: Employment rate age-group 20 to 64, EU-28, 2002–2016
(%)



Source: Eurostat (online data code: t2020_10)

The headline indicator '**Employment rate — age group 20 to 64**' shows the share of employed 20 to 64 year olds in the total EU population ([13]) (see Figure 1.1).

In 2016, 71.1 % of the EU population aged 20 to 64 were employed. This is by far the highest share that has been observed since 2002. However, it is still 3.9 percentage points behind the EU 2020 employment target of 75 %. The target excludes people below the age of 20 because many 15 to 19 year olds are still in education or training and are not seeking employment. As a result they tend to show low activity rates — only 20.3 % were part of the labour force in 2016 ([14]).

Not all people are economically active. In 2016, 6.5 % of the population were unemployed, the remaining 22.5 % were inactive, meaning they were not (actively) looking for work.

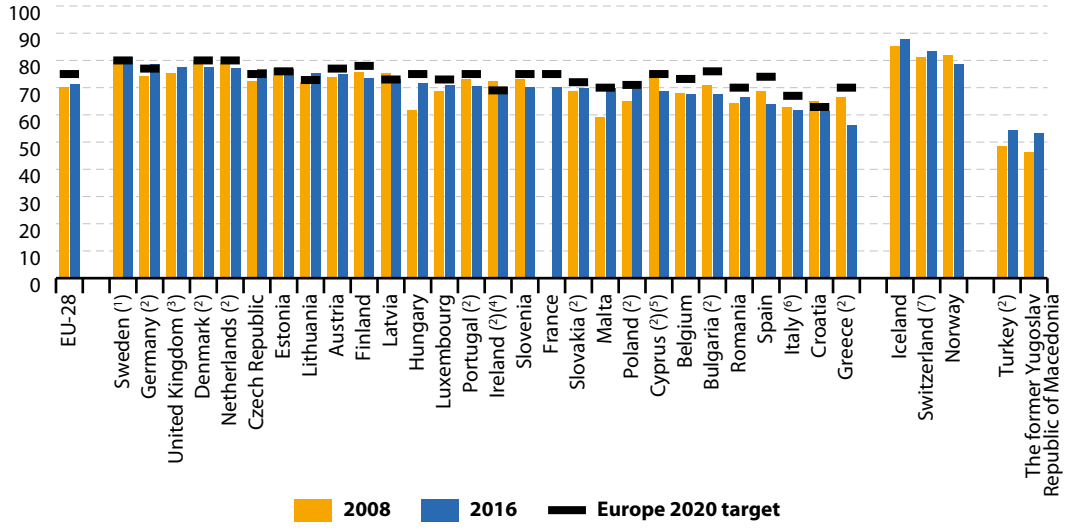
1.2.1 North–south divide in employment rates across the EU

In 2016 employment rates among Member States ranged from 56.2 % in Greece to 81.2 % in Sweden (see Figure 1.2). Northern and central European countries recorded the highest rates; eight countries even exceeded the 75 % EU employment target. With employment rates below 65 %, Mediterranean countries dominated the lower end of the scale. Employment rates in EFTA countries Iceland and Switzerland were higher than in any EU Member State.

Between 2008 and 2013, employment fell in most EU countries, since then it recovered for all Member States except Luxembourg, which experienced rising employment between 2008 and 2013 and a small decline of 0.4 percentage points since 2013. However, in 16 Member States

([13]) The reason for choosing this age group over the 'usual' working-age population 15 to 64 years old is explained in the section '"Activity", "employment", "unemployment" and "labour force" — main definitions' earlier in this chapter.
([14]) Source: Eurostat (online data code: lfsa_pganws).

Figure 1.2: Employment rate age-group 20 to 64, by country, 2008 and 2016
(%)



(1) Target: more than 80 %.
(2) Break(s) in time series between 2008 and 2016.
(3) No target in National Reform Programme.
(4) Target: 69–71 %.
(5) Target: 75–77 %.
(6) Target: 67–69 %.
(7) 2010 data (instead of 2012).

Source: Eurostat (online data code: t2020_10)

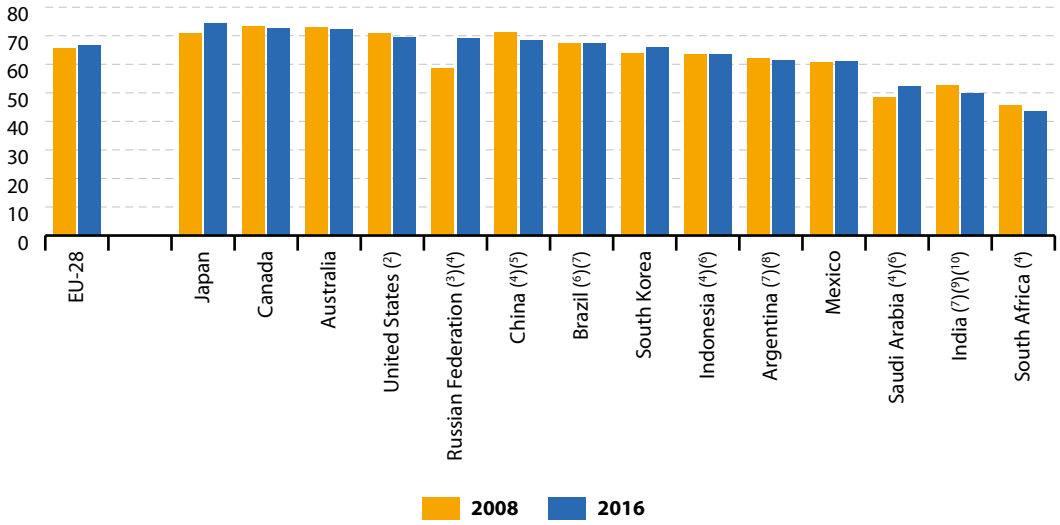
the employment rates were still below their 2008 levels in 2016. This indicates these countries may still have not fully recovered from the impacts of the crisis on their labour markets. The strongest falls were recorded in Greece (– 10.1 percentage points), Cyprus (– 7.7 percentage points) and Spain (– 4.6 percentage points). However, all these countries were back on a 'growth path' by 2016. Since 2008 employment rates have grown the most in Malta (10.4 percentage points) and Hungary (10.0 percentage points).

To reflect different national circumstances, the common EU target has been translated into national targets (15). These range from 62.9 % for Croatia to 80.0 % for Denmark, the Netherlands and Sweden. In 2016, seven Member States had already met their national employment targets. Lithuania surpassed its national target by 2.4 percentage points, with an employment rate of 75.2 %. Germany, the Czech Republic, Sweden, Ireland, Estonia and Latvia also recorded employment rates above their national targets. Of the remaining Member States, Malta was closest to its national target, with 0.4 percentage points below. Greece and Spain were the most distant, at 13.8 and 10.1 percentage points below their national targets, respectively.

Compared with the world's other main economies, the EU employment rate lies in the middle of the range (see Figure 1.3). In most non-EU G20 countries, the employment rate ranged between 74.3 % for Japan and 61 % for Mexico. Three countries experienced lower levels in 2016: Saudi Arabia (52.5 %), India (49.9 %) and South Africa (43.7 %).

(15) See 'Europe 2020 Targets'

Figure 1.3: Employment rate age-group 15 to 64, by country, 2008 and 2016 ([1])
(%)



([1]) International data for the age group 20–64 are not available, therefore this graph refers to the age group 15–64.
([2]) Non standard age group 16-64.
([3]) 2008 data refer to non standard age group 15-72.
([4]) 2015 data instead of 2016.
([5]) Non standard age group 16+.
([6]) 2009 data instead of 2008.
([7]) 2014 data instead of 2016.
([8]) Geographical coverage: main cities or metropolitan areas; low data reliability.
([9]) Age group 15+.
([10]) 2010 data instead of 2008.

Source: Eurostat (online data code: lfsi_emp_a) and the International Labour Organisation (ILOSTAT)

1.2.2 Highest employment rates recorded in regions in north-western and central Europe

The differences in the employment rate across Member States, shown in Figure 1. 2, are also reflected in the cross-country regional distribution of employment rates (at NUTS 2 level). Map 1 (overleaf) shows that the highest regional employment rates were mainly recorded in north-western and central Europe, particularly in Germany, Sweden, the United Kingdom, the Netherlands, Austria and the Czech Republic. In 2016, the Finnish region 'Åland' had the highest employment rate in the EU, at 86.2 %, followed by 'Stockholm' (Sweden) and 'Berkshire, Buckinghamshire and Oxfordshire' (United Kingdom), both 83.4 %. At the other end of the scale, the lowest rates were observed around the Mediterranean, in particular in southern Italy and Spain, and in Greece, as well as in the French overseas regions and the outlying Spanish autonomous cities (Ceuta and Melilla). In 2016, the Italian regions Campania, Calabria and Sicilia had the lowest employment rates in the EU of less than 45 %.

Map 2 (overleaf) shows the change in regional employment rates since 2008. Among the 275 NUTS 2 regions for which data are available, 43 % experienced a fall in their employment rates over the observed period. Among the hardest hit were several regions in Greece, with reductions of 8 percentage points or more. In contrast, employment rates increased in 154 regions from 2008 to 2016. Growth rates of 4 percentage points or more were observed in 57 of these regions, 24 of which were in Germany. Increases of more than 8 percentage points were recorded for regions in Hungary (Észak-Alföld, Észak-Magyarország, Dél-Dunántúl, Dél-Alföld), Malta, the United Kingdom (Inner London — West), Germany (Berlin), Romania

(Nord-Est), Poland (Dolnoslaskie) and France (Corse).

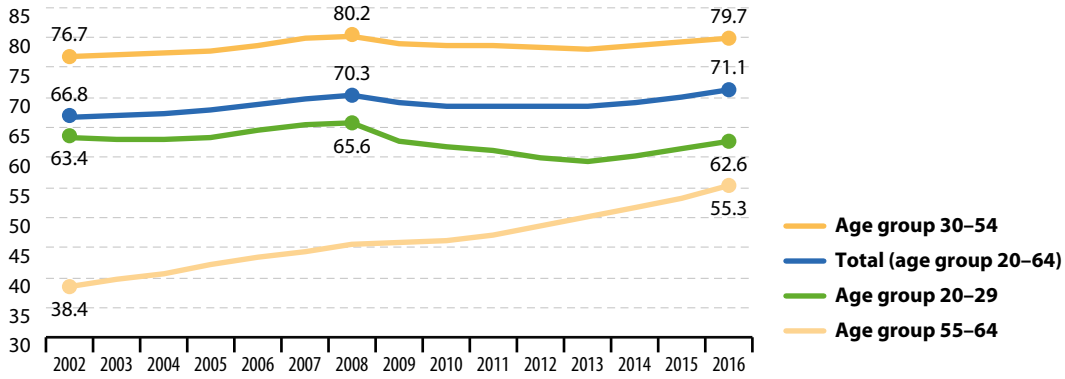
1.2.3 Urban areas in Baltic, southern and eastern Member States reporting higher employment rates

Employment rates vary not only between regions, but also by degree of urbanisation. This reflects differences in economic performance, industrial structure and the skill composition of the local population. In 2016, the EU employment was almost equally distributed among more and less densely populated areas, with cities recording an employment rate of 71.1 %, towns and suburbs 71.2 % and rural areas 70.8 % (for age group 20 to 64) ([16]). However, in most western European countries (Belgium, Germany, France, the United Kingdom, the Netherlands and Austria) employment rates tend to be higher in rural areas. In contrast, most Baltic (Estonia, Latvia and Lithuania), southern (Spain, Italy, Cyprus and Malta) and central or eastern Member States (Bulgaria, Hungary, Poland, Slovakia, Romania and Croatia) exhibit higher employment rates in cities. The exceptions are Greece, which records higher employment rates in rural areas (60.1 %) than in cities (54.5 %), Slovenia (70.8 % in rural areas, 68.9 % in cities) and Portugal, which also has slightly higher employment rates in rural areas than in cities, 70.7 % and 69.2 % respectively. In the Nordic EU countries, the Czech Republic, Slovenia and Ireland, the urban-rural employment rates differ only slightly. This pattern is also roughly mirrored in the differences in poverty by degree of urbanisation (see also the chapter on 'Poverty and social exclusion', page 129).

1.2.4 Lower employment rates of younger and older people

In 2016, the employment rate of people aged 30 to 54 was significantly higher than for the overall working-age population aged 20 to 64 (see Figure 1.4). In contrast, considerably lower employment rates were observed for young people aged 20 to 29. In addition, the employment gap between the young cohort and those aged 30 to 54 years has widened in recent years. This may reflect the generally less secure position of young people in the labour market, which makes youth employment more sensitive to the macro-economic situation than adult employment. Another important root cause might be the structural characteristics of school-to-work transitions. These structural factors include, among others, unsatisfactory outcomes of education and training systems, segmentation of labour markets affecting young people in particular, as well as the low capacity of public

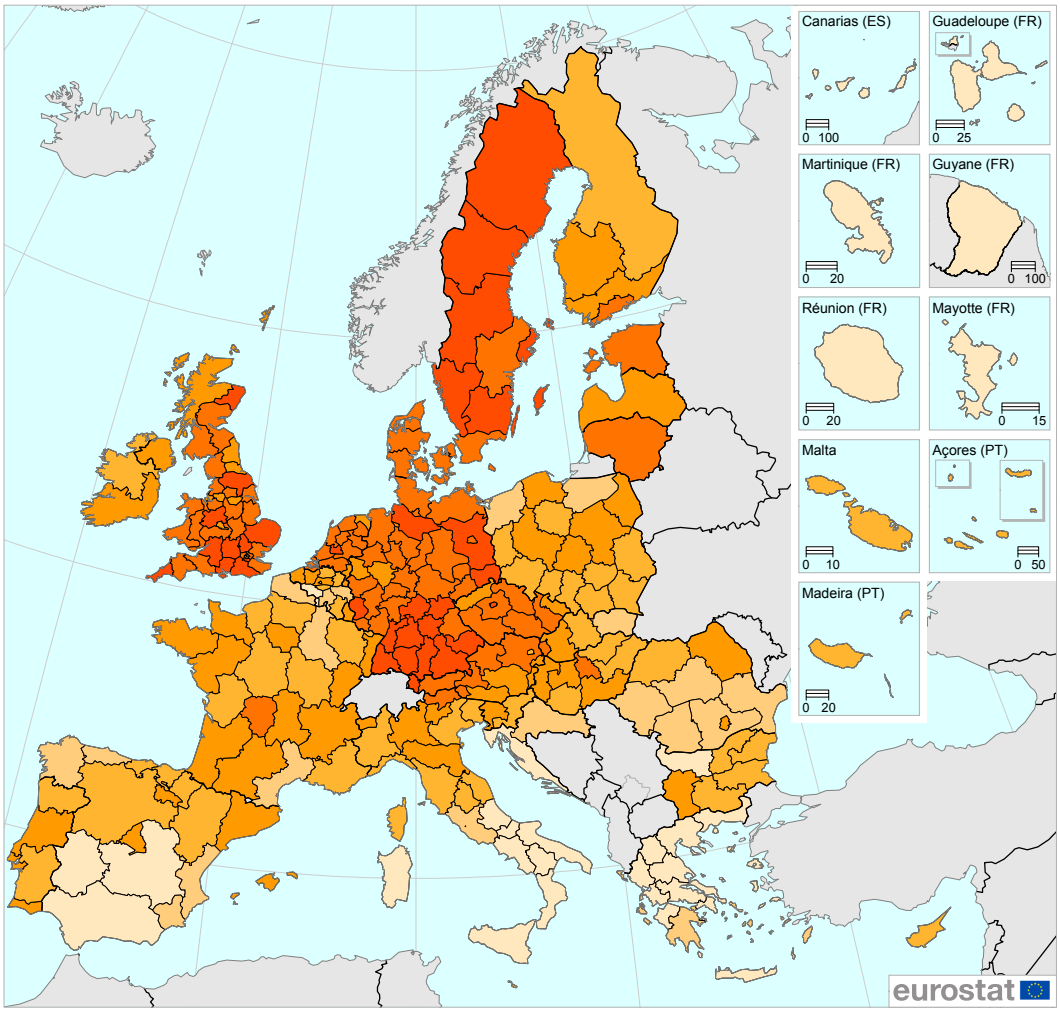
Figure 1.4: Employment rate, by age group, EU-28, 2002–2016
(%)



Source: Eurostat (online data codes: lfsa_pganws, t2020_10 and tsdde100)

([16]) Source: Eurostat (online data code: lfst_r_ergau).

Map 1.1: **Employment rate age-group 20 to 64, by NUTS 2 regions, 2016**
(% of population aged 20–64)

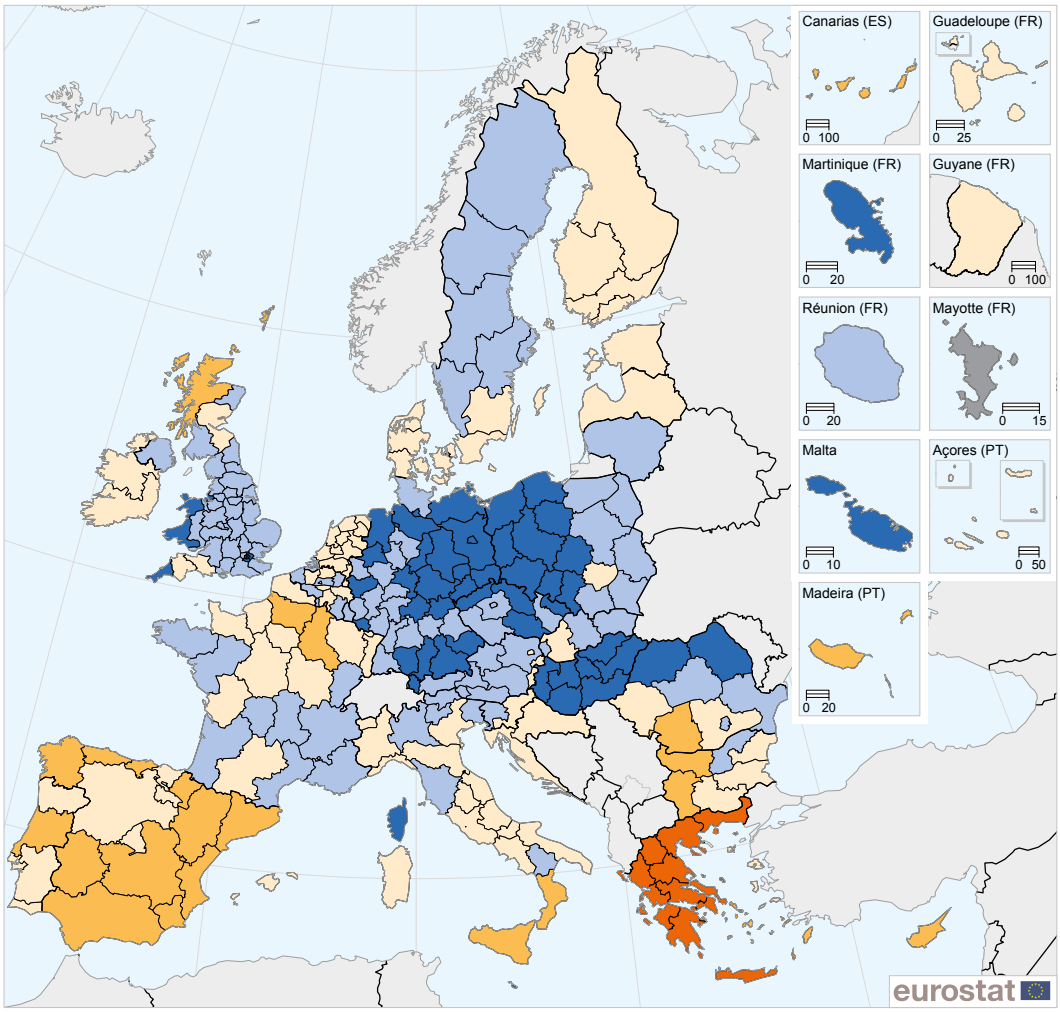


EU-28 = 71.1

Administrative Boundaries: © EuroGeographics © UN-FAO © Turkstat
Cartography: Eurostat — IMAGE, 26/06/2017

Source: Eurostat (online data code: lfst_r_lfe2emprt)

Map 1.2: Change in employment rate age-group 20 to 64, by NUTS 2 regions, 2008–2016 (1)
(percentage points difference between 2016 and 2008, population aged 20–64)



(1) Breaks in time series between 2008 and 2016 for several regions (too numerous to list); change 2010–2016 for London (UK) and Slovenia.
Source: Eurostat (online data code: lfst_r_lfe2emprt)

employment services to provide tailored services to young people and limited outreach to young people in the most vulnerable situations ([17]).

The lowest employment rate among the working-age population was reported for the group aged 55 to 64 years. However, employment in this group has risen more or less continuously since 2002. Growth has been even more pronounced for older women (19.8 percentage points) than for older men (13.8 percentage points) since 2002. These increases could be linked to structural factors such as cohorts with better educational attainment moving up the age pyramid as well as recent pension reforms, such as increases in the pensionable age, the age for early retirement and length of contribution. This has led to longer working lives for both women and men ([18]). The duration of working life is measured as the number of years a person aged 15 is expected to be active in the labour market. Over the past years, this has risen in the EU by 2.5 years, from 32.9 years in 2002 to 35.4 years in 2015. The rise was higher for women (3.3 years) than for men (1.7 years). However, in 2015 men could still expect to stay in work much longer (37.9 years) than women (32.8 years) ([19]). Other factors that have extended working life include flexible working time and work organisation, access to training for older workers and long-term care and childcare provision ([20]).

These trends reaffirm the Europe 2020 strategy's focus on 55 to 64 year old men and women as a way of boosting the overall employment rate: 'A longer working life will both support the sustainability and the adequacy of pensions, as well as bring growth and general welfare gains for an economy. Higher employment rates among older people are also a precondition for the EU's ability to reach the 2020 target, just as adequate pension systems are a precondition for achieving the poverty reduction target' ([21]) (see also the chapter on 'Poverty and social exclusion', page 129).

Interestingly, for a majority of Member States (19 countries in total), and most notably for Spain, Ireland, Italy, Portugal and Bulgaria, the rise in the employment rate for older people (aged 55 to 64) between 2006 and 2016 was associated with a fall in the employment rate for younger people (aged 20 to 24) ([22]). In this context, the higher employment rates for the older age groups are likely to contribute to increases in the overall employment rate unless it is counterbalanced by bigger increases in youth unemployment or youth inactivity.

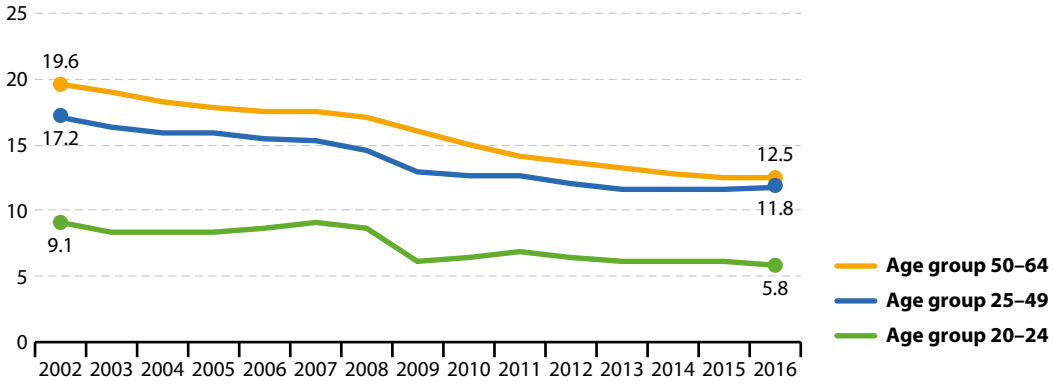
Employment rates for younger and older people are considerably lower than the average employment rates. However, while employment rates for the elderly are rising, young people are one of the most vulnerable groups on the labour market.

1.2.5 Women still have lower employment rates but the gender employment gap is shrinking

Despite women becoming increasingly well qualified and even out-performing men in terms of educational attainment (see also the chapter on 'Poverty and social exclusion', page 129), the employment rates and activity rates of women are lower than those for men. But for all age groups, the **gender employment gap** — the difference in employment rates between men and women — has been decreasing (see Figure 1.5). A number of structural factors influencing the participation of women in the labour market may account for why they have been 'catching up' with men. These include changes in social values and attitudes, policies enabling women to reconcile paid work with household responsibilities such

([17]) European Commission, *Youth Employment*, European Semester Thematic Fiche, 2016 (p. 1).
([18]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016.
([19]) Source: Eurostat (online data code: tsdde420).
([20]) See footnote 18.
([21]) See footnote 18, p. 57.
([22]) Source: Eurostat (online data code: lfsa_ergan).

Figure 1.5: Gender employment gap, by age group, EU-28, 2002–2016 ([1])
(Difference between employment rates of men and women, in percentage points)



([1]) Break in series in 2005.
Source: Eurostat (online data code: lfsa_ergan)

Box 1.1: Employment policies targeting women

One of the priorities of the flagship initiative 'An Agenda for new skills and jobs' is to create new momentum for flexicurity policies aimed at modernising labour markets and promoting work through new forms of flexibility and security. Under the flexibility component, 'Flexible and reliable contractual arrangements', the flagship initiative calls for 'putting greater weight on internal flexibility in times of economic downturn'. According to the 2010 European Commission Communication 'An Agenda for new skills and jobs: A European contribution towards full employment' ([23]), 'Flexibility also allows men and women to combine work and care commitments, enhancing in particular the contribution of women to the formal economy and to growth, through paid work outside the home.'

The security component is addressed by the EU employment package 'Towards a job-rich recovery' under its objective of restoring the dynamics of labour markets. As laid down in the 2012 European Commission Communication 'Towards a job-rich recovery' ([24]), this calls for 'security in employment transitions', such as the transition from maternity leave to employment: 'the integration of women in the labour market [deserves particular attention], by providing equal pay, adequate childcare, eliminating all discrimination and tax-benefit disincentives that discourage female participation, and optimising the duration of maternity and parental leave.'

More recently, the European Pillar of Social Rights sets out a number of key principles and rights to support fair and well-functioning labour markets and welfare systems. There are three main categories of the pillar: 1) Equal opportunities and access to labour market; 2) Fair working conditions; and 3) Social protection and inclusion. Many of the principles support higher labour market participation of women, and notably those related to gender equality, work-life balance, childcare and support to children and long-term care.

([23]) European Commission, *An Agenda for new skills and jobs: A European contribution towards full employment*, COM(2010) 682 final, 2010 (p. 5).
([24]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012 (p. 10).

as child care provision, flexible working hours, reduction in financial disincentives and pension reforms ([25]). European employment policies promoting new forms of flexibility and security are addressing the specific situation of women to help raise their employment rates in line with the headline target (see Box 1.1).

However, despite an increasing share of women in the EU labour force, their absolute numbers are still fewer than men. In 2016, the gender employment gap was highest for 30 to 34 year olds, at 14.3 percentage points. This age group also showed the highest activity rate gap between men and women at 14.5 percentage points. This is not surprising as this is the age when women are more likely to take responsibility for childcare and household duties than men. In addition to caring responsibilities, women can face strong financial disincentives in tax-benefit systems when entering the labour market or wanting to work more. Time out of the labour force for these reasons might also affect employment in later years because finding a job becomes more difficult the longer a person is not employed. This might partially explain why gender employment gaps in 2016 were smaller for younger cohorts.

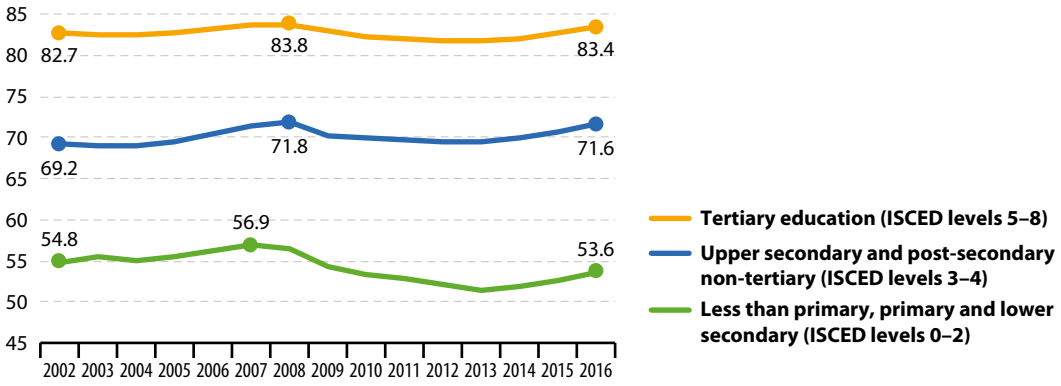
Gender gaps in older age cohorts are also particularly high, which may be a result of a cohort effect (women who had not participated in the labour force when they were young moving up the age pyramid) or reflect the lack of care facilities for grandchildren or dependent parents. Women are more likely than men to take on care responsibilities for elderly or dependent family members with long-term care needs and are therefore more likely to reduce their working hours or leave the labour market. In addition to care responsibilities, difficulties in finding a job after prolonged unemployment can further affect the employment rate of older female cohorts ([26]).

1.2.6 Higher education levels increase employability

Educational attainment levels are another reason why employment rates vary between different labour groups.

Employment rates are generally higher for more educated people (see Figure 1.6). In 2016, the employment rate among tertiary education graduates was much higher than the EU average total (71.1 %). In contrast, just slightly more than half of those with at most

Figure 1.6: Employment rate age group 20 to 64, by educational attainment level, 2002–2016 ([1])
(%)



([1]) Breaks in time series in 2005 and 2014 (switch from ISCED 1997 to ISCED 2011).

Source: Eurostat (online data code: tsdec430)

([25]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe in 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 22).
([26]) European Commission, *Labour market participation of women*, European Semester Thematic Fiche, 2016.

primary or lower secondary education were employed. The employment rate for people with upper secondary or post-secondary non-tertiary education was in between these levels and slightly above the overall EU average employment rate.

These findings underline the importance of education for employability (see Box 1.2). Increasing educational attainment and equipping people with skills for the knowledge society are, therefore, a major focus of European employment policies addressing Europe 2020 headline targets on employment and education (see the chapter on 'Education', page 107).

1.2.7 Employment rates among non-EU migrants are comparatively low

Economic migration is becoming increasingly important for the EU's ability to deal with a shrinking labour force and expected skills shortages. According to European Commission estimates, without net migration the working-age population aged 15 to 64 will shrink by 12 % in 2030 and by 33 % in 2060 compared with 2009 levels ([27]).

Country of origin can impact the labour market performance of individuals. Migrant workers from countries outside the EU tend to occupy low-skilled and insecure jobs with temporary contracts and poorer working conditions. Much lower employment rates are reported for this group than for EU citizens (see Figure 1.7) ([28]). In 2016, the employment rate of non-EU nationals aged 20 to 64 was 14.5 percentage points below the total employment rate (see Box 1.3). Migrants are also among the first to lose their jobs during economic setbacks. In addition, in the past few years, the EU experienced an unprecedented inflow of asylum seekers, with submitted asylum applications reaching 2.2 million in 2015 and the first nine months of 2016 ([30]). However, asylum seekers are not a homogeneous group. Their integration into the labour market depends highly on their level of education and the knowledge of the host-country language. Nevertheless, refugees are a small group among non-EU migrants (7 %). In 2014, more than half of non-EU born migrants aged 15–64 came to the EU for family reasons, followed by those that came for work (25 %) or study (7 %). The lowest employment rates were observed for those who migrated for family reunification and refugees, 53 % and 56 % respectively ([31]).

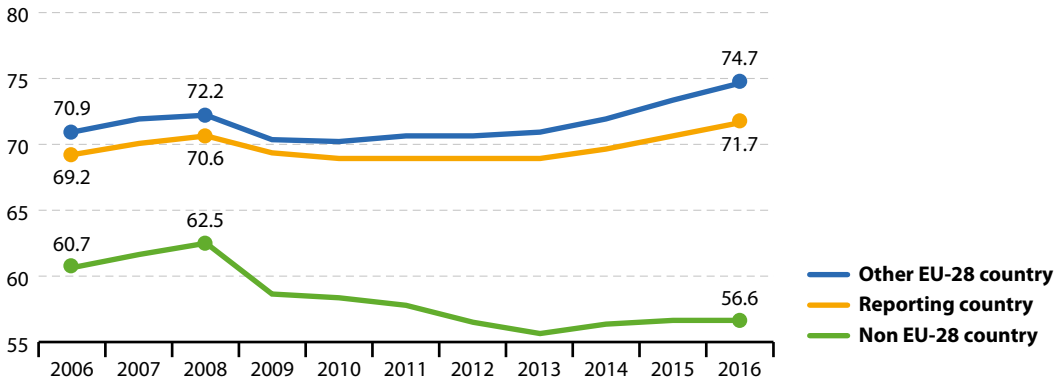
Box 1.2: Employment policies and education

Investing in skills is also a priority of the EU employment package 'Towards a job-rich recovery'. Under its objective of restoring the dynamics of labour markets, the European Commission calls for better monitoring of skill needs and 'a close co-operation between the worlds of education and work'.

It also addresses youth employment, calling for 'security in employment transitions', such as the transition of young people from education to work. It also reaffirms the EU's commitment to tackle the dramatic levels of youth unemployment, 'by mobilising available EU funding' and by supporting the transition to work 'through youth guarantees, activation measures targeting young people, the quality of traineeships, and youth mobility' ([29]).

([27]) European Commission, *An Agenda for new skills and jobs: A European contribution towards full employment*, COM(2010) 682 final, 2010 (p. 9).
([28]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 177).
([29]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012 (p. 10).
([30]) See footnote 28, p. 15.
([31]) See footnote 28, p. 114 ff.

Figure 1.7: Employment rate age group 20 to 64, by citizenship, EU-28, 2006–2016
(%)



Source: Eurostat (online data code: lfsa_ergan)

Box 1.3: Employment policies addressing migration

'In the longer term, and especially in view of the EU's demographic development, economic immigration by third-country nationals is a key consideration for the EU labour market' ([32]). The EU employment package 'Towards a job-rich recovery' specifically addresses the relevance of migration for tackling expected skills shortages: 'With labour needs in the most dynamic economic sectors set to rise significantly between now and 2020, while those in low-skills activities are set to decline further, there is a strong likelihood of deficits occurring in qualified job-specific skills.' Various directives help non-EU citizens to work and study in the EU. Among them, the EU Blue Card gives highly-qualified workers from outside the EU the right to live and work in an EU country, provided they have higher professional qualifications, such as a university degree, and an employment contract or a binding job offer with a high salary compared to the average in the EU country where the job is. The EU Blue Card applies in 25 of the 28 EU countries.

([32]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012 (p. 18).

1.3 EU's labour force is shrinking because of an ageing population

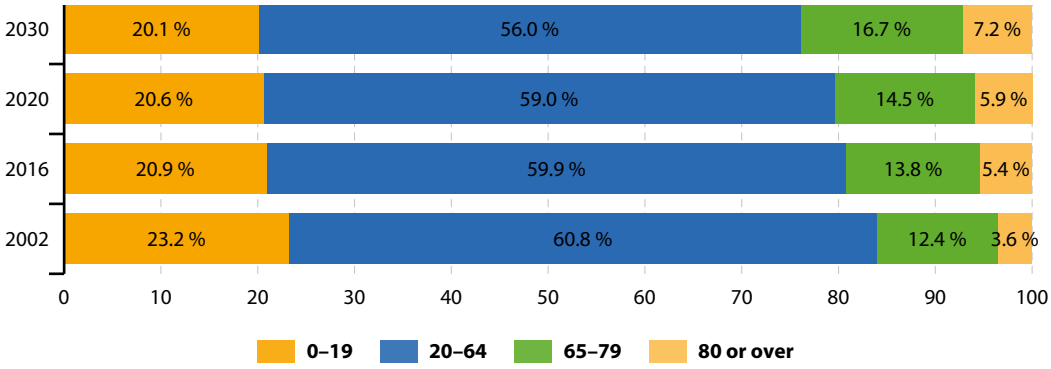
Long-term changes in the demographic structure of the EU population add to the need to increase employment rates. Despite a growing population, the EU's low fertility rates and rising life expectancy are shrinking its labour force and increasing its old-age dependency ratio. Higher employment rates, especially for women, older workers and young people, are therefore needed to compensate for the expected decline of the working-age population (aged 20 to 64) by 1.9 million people by 2020.

Employment rates are a result of the interplay between the supply of and demand for workers in the labour market. Workers supply labour to businesses and businesses demand labour from workers, both in exchange for wages. Consumers play an important role in businesses' labour needs through their demand for products and services, which in turn is influenced by the economy's cyclical development. Labour supply is characterised by the number of working-age people available to the labour market (determined by demographic structure) and the skills they offer (approximated by their education and training).

However, the demographic structure of the economically active population, and its education levels, are two important factors that are hard to influence in the short term.

The EU is confronted with a growing, but ageing population, driven by low fertility rates and a continuous rise in life expectancy. This ageing, already apparent in many Member States, will lead to a higher share of older people and a lower share of people aged 20 to 64 in the total population in the coming decades (see Figure 1.8). According to the European Commission Demography report 2015 ([33]), this

Figure 1.8: Population age structure, by major age groups, EU-28, 2002, 2016, 2020, 2030 ([1]) (%)



([1]) 2020 and 2030 data stem from Eurostat population projections (base year 2015).

Source: Eurostat (online data codes: demo_pjan and proj_15npms)

([33]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion & Eurostat), *Demography report — 2015 edition*, Luxembourg, Publications Office of the European Union, 2015 (p. 43).

means that despite a growing population, the EU labour force is shrinking, which may lead to future labour shortages. This is a potential threat to economic growth, which may have to rely solely on productivity gains in future. It may also increases the burden on the employed population to provide for the rising social expenditure requirements of an ageing population.

Over the past two decades the total EU population has grown from 475 million in 1990 to more than 510 million in 2016 ([34]). Between 2002 and 2016 the number of older people aged 65 and above increased by 25 %. The rise was particularly steep for the group aged 80 or over. The working age population aged 20 to 64 years grew only slightly, by 3 % over the same period. In contrast, the number of 0 to 19 year olds fell by 6 %.

While the most recent projections ([35]) predict rapid growth in the number of older people, the population aged 20 to 64 years is expected to start shrinking in the next few years as more baby boomers born between 1946 and 1964 enter their 60s and retire. As a result, the share of 20 to 64 year olds is expected to gradually decline from 60 % in 2015 to 59 % in 2020. This equals a reduction of 2 million people. At the same time, the number of older people aged 65 or over will grow by about 9 million, meaning that in 2020 every fifth person in the EU will be 65 or above. As Figure 1.8 shows, these trends will continue at an even faster rate in the following decade. The population aged 20 to 64 is expected to shrink further and those aged 65 or over are expected to make up almost a quarter of the total population in 2030.

The baby boomer generation was the result of high fertility rates in several European countries over a 20- to 30-year period to the mid-1960s. They continue to comprise a significant part of the working population, however, the first of this large group are now reaching retirement age. As a result of these demographic changes the **old-age dependency ratio** has increased from 23.9 % in 2002 to 29.3 % in 2016 ([36]). This ratio shows the share of the population aged 65 and above compared with the population of 20 to 64 year olds. This means that while there were 4.2 people of working age for every dependent person over 65 in the EU in 2002, this number had fallen to 3.4 people by 2016. By 2030, the old-age dependency ratio is projected to reach 39.1 %, meaning there will be fewer than three people of working age for every dependent person over 65 ([37]).

These trends underline the importance of making the most of the EU's labour potential by raising the employment rate for men and women over the coming years. To meet labour market needs in a sustainable way, efforts are needed to help people stay in work for longer. Particular attention needs to be given to women, older workers and young people. With regard to young people, it is important to help them find work as soon as they leave education and ensure they remain employed.

([34]) Note that the total population figures presented here differ from the population concept used in the EU LFS, which only covers resident persons living in private households, excluding the population living in institutional households (such as workers' homes or prisons). The data are based on Eurostat data tables (demo_pjan) and (proj_15npms).
([35]) Eurostat, Population projections data, EUROPOP2015 main scenario.
([36]) Source: Eurostat (online data code: tsdde510).
([37]) Source: Eurostat (online data code: tsdde511).

1.4 Employment and unemployment trend

Following the recovery in GDP and employment growth, the share of newly employed people is at its highest level since 2009.

Between 2008 and 2016, employment grew fastest in the professional, scientific and technical sector and the administrative sector, but declined the most in the construction and agricultural sectors.

Over the past few years increases in part-time work and fixed-term contracts have been observed. Young people have been the most affected, with 16.0 % of 15 to 24 year olds involuntarily employed on time-limited contracts and 8.4 % involuntarily in part-time work in 2016.

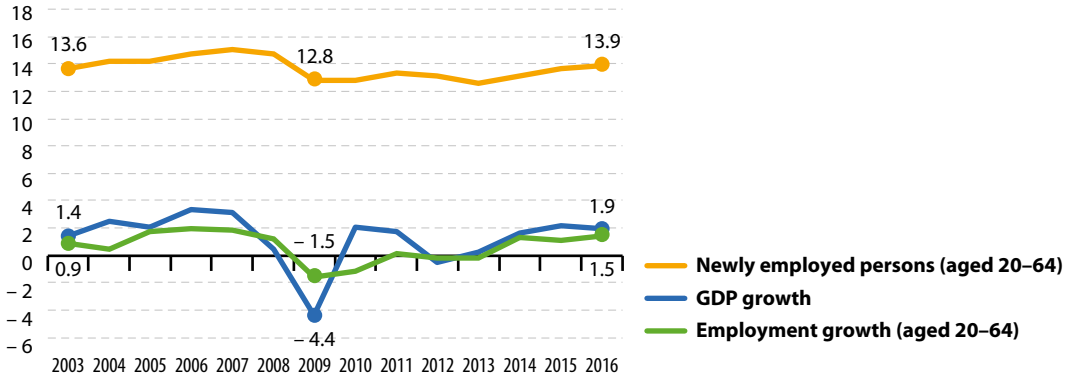
With an unemployment rate of 18.7 % in 2016, young people aged 15 to 29 were clearly at a disadvantage compared with the overall population.

Employment (and unemployment) rates are closely linked to the business cycle. Usually this is expressed in terms of GDP growth, which can be seen as a measure of an economy's dynamism and its capacity to create jobs. Figure 1.9 illustrates this relationship, showing similar patterns for **GDP growth, employment growth and the share of newly employed people in total employment** ([38]).

As Figure 1.9 illustrates, GDP growth brought about a job-rich recovery in 2016 with employment picking up by 1.5 %. However, GDP growth is not necessarily associated with employment growth. In 2010 and 2011, GDP growth picked up as well, while employment remained at a standstill. This pattern of 'jobless growth' stems from the fact that GDP grew mostly because of an increase in productivity and hours

Figure 1.9: GDP growth, employment growth and newly employed persons, EU-28, 2003–2016 ([1])

(GDP growth and employment growth: percentage change over previous period; newly employed persons: share of persons aged 20 to 64 whose job started within the last 12 months in total employment)

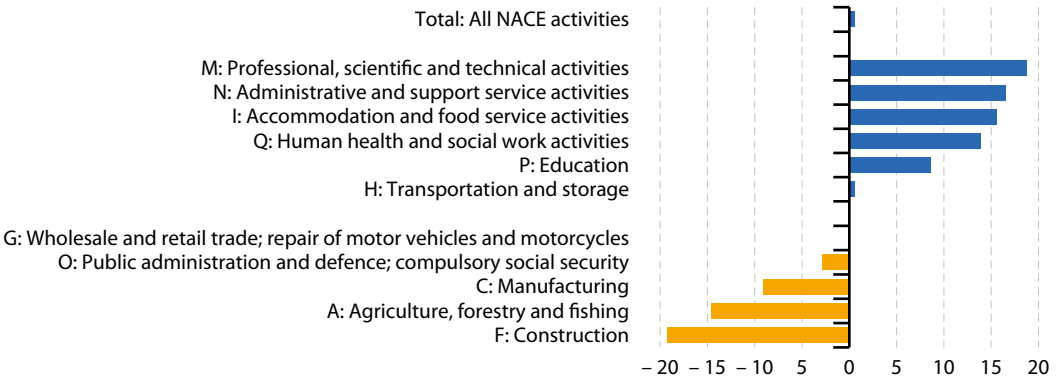


([1]) Employment growth and newly employed persons: break in time series in 2005.

Source: Eurostat (online data codes: nama_10_gdp, lfsa_pganws and lfsa_enewasn)

([38]) People who started their job within the past 12 months.

Figure 1.10: Employment growth by economic sector, EU-28, 2008–2016
(%)



Source: Eurostat (online data code: lfsa_egan2)

worked, leaving little room for employment growth ([39]).

The link between GDP growth and employment growth is also reflected in the share of newly employed people as a share of total employment. This dropped considerably in 2009, following the contractions in GDP and employment in the same year. In 2016, following the recovery in GDP and employment growth, the share of newly employed people was at its highest level since 2009 (13.9 %).

1.4.1 Professional, scientific and technical sector and administrative sector show strongest signs of jobs recovery

Jobs growth is unevenly distributed across economic sectors and strongly dependent on general economic conditions as well as developments within these sectors. Overall, employment across all EU economic sectors ([40]) rose slightly between 2008 and 2016 (see Figure 1.10). High-end occupations related to professional, scientific and technical activities grew the fastest. Traditional service sectors also experienced employment growth.

However, the construction, agriculture and manufacturing sectors, which were also heavily affected by the economic crisis, showed the strongest declines between 2008 and 2016. Because these sectors are male-dominated, it is plausible that men have been affected more strongly by the decline in these sectors than woman ([41]).

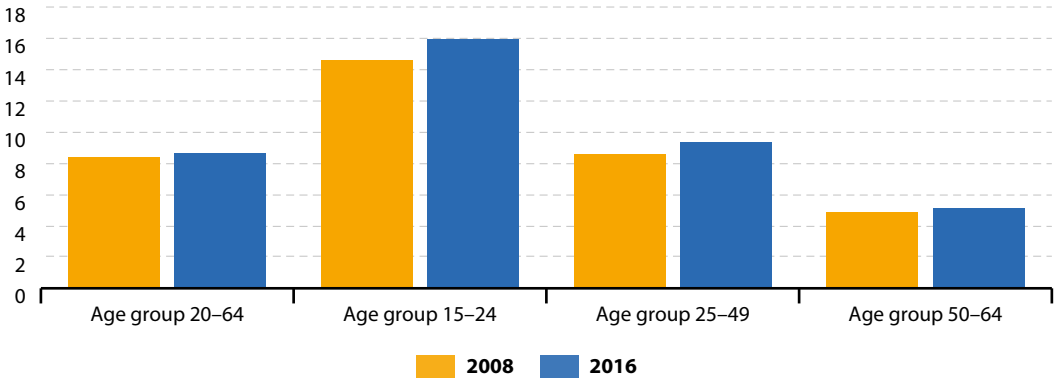
1.4.2 Involuntary non-standard work contracts most widespread among young people

In 2016, 13.3 % of employees aged 20 to 64 in the EU were working on a fixed-term contract. Temporary employment has been relatively stable around 13 % over the past decade, with a slight upward tendency. It was most widespread among young people, with 43.8 % of 15 to 24 year olds working on a time-limited contract. Temporary employment was much lower among 25 to 54 year olds at 12.1 % and for older people aged 55 to 64 at 6.7 % ([42]).

The significant over-representation of young people in temporary work reflects not only changes in labour market demand, but also

([39]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2012*, Luxembourg, Publications Office of the European Union, 2012 (p. 57).
([40]) See Statistical classification of economic activities in the European Community (NACE).
([41]) Source: Eurostat (online data code: lfsa_egan2).
([42]) Source: Eurostat (online data code: lfsa_etpgan).

Figure 1.11: Involuntary temporary employees, by age group, EU-28, 2008 and 2016 (1)
(% of total employees)



(1) Data have low reliability.

Source: Eurostat (online data codes: lfsa_etgar, lfsa_etgaed and lfsa_eegaed)

structural features of educational systems and cultural norms. In many Member States, for instance, young people prefer temporary work because they are participating in education and training or because of public policies promoting autonomy from an early age (for example, monthly support allowance, availability of affordable housing and free education) ([43]).

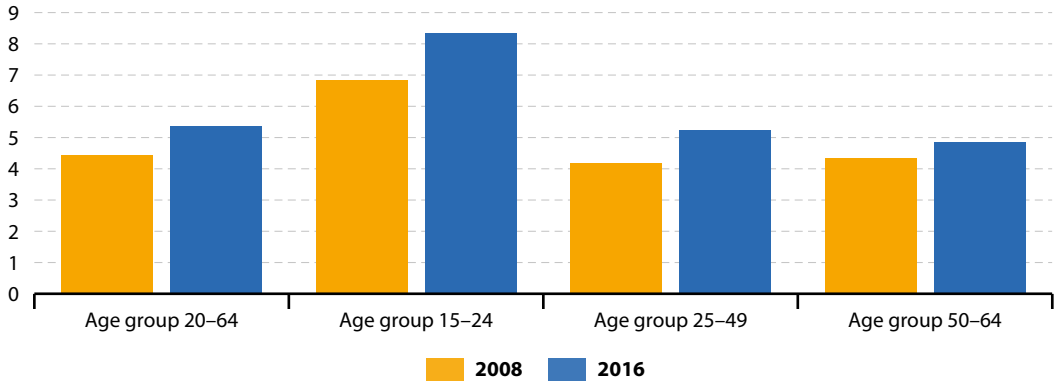
However, for many people a fixed-term contract, rather than a permanent one, is not always a personal choice. In this respect, data on involuntary temporary employment provides a better insight into the overexploitation of fixed-term contracts. In 2016, 8.7 % of employed 20 to 64 year olds were involuntarily working on temporary contracts (see Figure 1.11). Again, the share was much higher for young people aged 15 to 24, at 16.0 %. Despite some fluctuations, the overall trend since 2006 indicates growing use of involuntary fixed-term contracts. Although fixed-term contracts could act as a stepping stone for young graduates to permanent jobs, there is also the risk that young people stay trapped in a series of temporary contracts ([44]).

In 2016, 18.8 % of all employees aged 20 to 64 in the EU worked on a part-time contract. More than a quarter (28.5 %) were in involuntary part-time employment. The share of involuntary part-time employed in total employment rose from 4.4 % in 2008 to 5.4 % in 2016. As with involuntary temporary employment, young people are affected the most (see Figure 1.12). For all age groups the share of women in involuntary part-time employment exceeded that of men. The gender gap is widening with age, from 4 percentage points for 15 to 20 year olds to 5.1 percentage points for the 50 to 64 age group.

The expansion of involuntary part-time work in recent years indicates that an increasing number of people undertake part-time employment not by choice, for example, for more flexible arrangements that allow better reconciliation between work and private life, but because they cannot find a full-time job ([45]). Involuntary part-time employment is another sign of labour

([43]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2011*, Luxembourg, Publications Office of the European Union, 2012 (p. 33).
([44]) Id., p. 91.
([45]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 90).

Figure 1.12: Involuntary part-time employment, by age group, EU-28, 2008 and 2016 ([1])
(% of total employment)



([1]) Data for 2008 have low reliability.

Source: Eurostat (online data codes: lfsa_epgar and lfsa_epgaed)

market segmentation, which could have important implications for income and potentially increase the risk of poverty and social exclusion ([46]).

1.4.3 Younger people are at higher risk of unemployment

In 2016, 8.4 % of 20 to 64 year old EU residents were unemployed, which is a 2.2 percentage point improvement compared to 2013 when the unemployment rate peaked at 10.6 %. However, the unemployment rate does not include people who became discouraged and stopped looking for work because they are not considered part of the labour market. Nevertheless, they still represent a potential additional pool of the work force. In 2016, 8.8 million people in the EU were available and would have liked to work but were not seeking employment. This equals 2.3 % of the population aged 15 to 74 ([47])([48]).

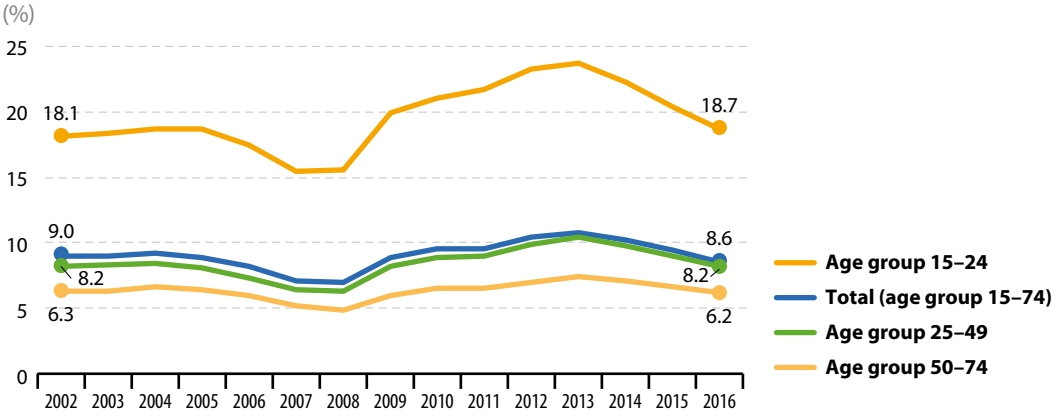
Like employment, a clear link exists between unemployment and education: unemployment rates are generally lower for people with higher education levels. In 2016, only 5.1 % of 15 to 74 year olds with tertiary education were unemployed, whereas 16.1 % of people with at most lower secondary education were looking for a job ([49]).

Young people aged 15 to 24 generally face a higher risk of being unemployed. In 2016, their unemployment rate was more than double the rate for the entire age group of 15 to 74 year olds. The risk of unemployment is particularly high for low-educated young people who have completed only lower secondary education (early leavers from education and training; see the chapter on 'Education', page 107). However, the group of unemployed persons aged 15 to 24 is not necessarily large, as many young people are studying full-time and are therefore neither working nor looking for a job. The youth unemployment ratio, which reflects the share of unemployed for the whole population of the same age group, is much lower and rose from 6.9 % in 2008 to 7.8 % in 2016.

In the context of the Europe 2020 strategy, it is important that young people maximise their professional working lives by engaging in employment as soon as possible and staying employed. This is specifically addressed through the flagship initiative 'Youth on the Move' (see Box 1.4).

([46]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 90).
([47]) The target population of the EU LFS are resident persons living in private households, excluding the population living in institutional households (such as workers' homes or prisons).
([48]) Source: Eurostat (online data code: lfsi_sup_a).
([49]) Source: Eurostat (online data code: lfsa_urgaed).

Figure 1.13: Unemployment rate by age group, EU-28, 2002–2016 ([1])



([1]) Break in time series in 2005.

Source: Eurostat (online data code: lfsa_urgaed)

Box 1.4: Policies tackling youth unemployment

The Europe 2020 flagship initiative 'Youth on the Move' emphasises that 'youth unemployment is unacceptably high' in the EU, and that 'to reach the 75 % employment target for the population aged 20 to 64 years, the transition of young people to the labour market needs to be radically improved'. To this end, the flagship initiative focuses on four main lines of action as laid down in the 2010 European Commission Communication 'Youth on the Move: An initiative to unleash the potential of young people to achieve smart, sustainable and inclusive growth in the European Union' ([50]):

- Lifelong learning, to develop key competences and quality learning outcomes, in line with labour market needs. This also means tackling the high level of early school leaving.
- Raise the percentage of young people participating in higher education or equivalent to keep up with competitors in the knowledge-based economy and to foster innovation.
- Improve learning mobility programmes and initiatives, to support the aspiration that by 2020 all young people in Europe should have the possibility of spending a part of their education abroad, including via workplace-based training.
- Urgently improve the employment situation of young people, by presenting a framework of policy priorities for action at national and EU level to reduce youth unemployment by facilitating the transition from school to work and reducing labour market segmentation.

([50]) European Commission, *Youth on the Move: An initiative to unleash the potential of young people to achieve smart, sustainable and inclusive growth in the European Union*, COM(2010) 477 final, 2010 (p. 3).

1.5 Skills mismatches in the labour market

Improving qualification levels is essential to meet the growing demand for a highly skilled labour force in the EU.

Recent projections show the EU is relatively on track to match educational achievements to labour market needs, with labour supply exceeding the demand for all qualifications types.

In 2016, 10.8 million people worked in occupations below their qualification level.

Data on job vacancies point to a possible deterioration in the job-matching process from 2010 to 2014. Unemployment rose while job vacancies remained stable or increased. However, in between 2014 and 2016 the labour market expanded, showing falling unemployment rates and increasing vacancy rates.

Since 2013 long-term unemployment has been declining but still accounts for nearly half of all unemployment.

A well-functioning labour market depends largely on matching the labour force's skills and qualifications to those demanded by employers. Although some skills mismatch is inevitable, high and persistent mismatches can be costly for employers, workers and society at large ([51]). Matching educational outcomes and labour market needs is a key component of the Europe 2020 strategy (see Box 1.5). 'Equipping people with the right skills for employment' has been identified as one of four priorities of the flagship initiative 'An Agenda for new skills and jobs'. In particular, the impact of the economic crisis and persistently high unemployment have increased the need to better understand where future skills shortages are likely to lie in the EU ([52]).

1.5.1 Changes in labour force skills outpacing changes in employment trends

According to estimates from the European Centre for the Development of Vocational Training Cedefop ([53]), the distribution of skills in the labour force largely matched the qualification requirements of the labour market in 2016. However, labour supply exceeded demand for all qualification types, with the difference being particularly high for the low- and medium-level qualifications. The demand for a skilled labour force is likely to continue; the most recent forecasts from Cedefop indicate that between 2016 and 2025 about 15 million jobs requiring high educational attainment will be created, while low-qualified jobs will decline by more than 6 million (see Figure 1.14).

Overall, the Cedefop forecasts show a parallel rise in skills from both the demand and the supply side until 2025. Skill levels are expected to change faster for the labour force than those required by the job market. For instance, the share of the labour force holding only primary or lower secondary education is expected to decrease from 20.7 % in 2016 to 16.8 % in 2025, whereas the share of positions for people with low-level qualifications are projected to fall from 18.8 % to 15.4 %. However, this parallel development does not prevent potential skills mismatches, such as over-qualification (see section 1.5.2).

1.5.2 Higher over-qualification rates for most Member States

Skill mismatch is most commonly seen as the inability of employers to fill vacancies despite high unemployment. But it is not only a problem

([51]) European Commission, *Education and Training Monitor 2015*, Brussels, 2015 (p. 14).
([52]) European Commission, *An Agenda for new skills and jobs: A European contribution towards full employment*, COM(2010) 682 final, Strasbourg, 2010 (p. 8).
([53]) The Cedefop skills forecasts are available at http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

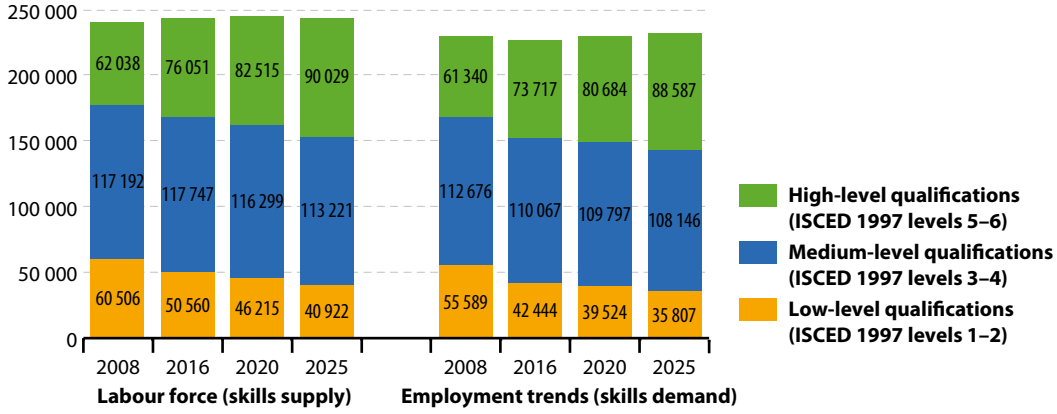
Box 1.5: Matching skills and labour market needs

Improving the matching process between labour supply and demand by adapting educational and training systems to produce the skills required on the labour market is a key priority of the Europe 2020 strategy's flagship initiative 'An Agenda for new skills and jobs'. It proposes a bundle of measures aimed at strengthening the EU's capacity to anticipate and match labour market and skill needs. These include labour market observatories bringing together labour market actors and education and training providers, measures enhancing geographical mobility throughout the EU, and actions towards better integration of migrants and better recognition of their skills and qualifications ([54]).

The 2016 New Skills Agenda for Europe launches a number of actions to ensure that the right training, the right skills and the right support is available to people in the European Union. It will aim to make better use of the skills that are available and to equip people with the new skills needed to help them find quality jobs and improve their life opportunities. The Commission invites Members States, social partners, the industry and other stakeholders to work together to: a) improve the quality and relevance of skills formation; b) make skills more visible and comparable; and c) improve skills intelligence and information for better career choices. Actions include: a Skills Guarantee, renamed 'Upskilling Pathways: New Opportunities for Adults', to help adults acquire a minimum level of literacy, numeracy and digital skills and/or acquire a broader set of skills by progressing towards an upper secondary qualification or equivalent, and a review of the European Qualifications Framework and the related annexes for a better understanding of qualifications and to make better use of all available skills in the European labour market.

Figure 1.14: Labour force and employment trends by qualification, EU-28, 2008, 2016, 2020 and 2025

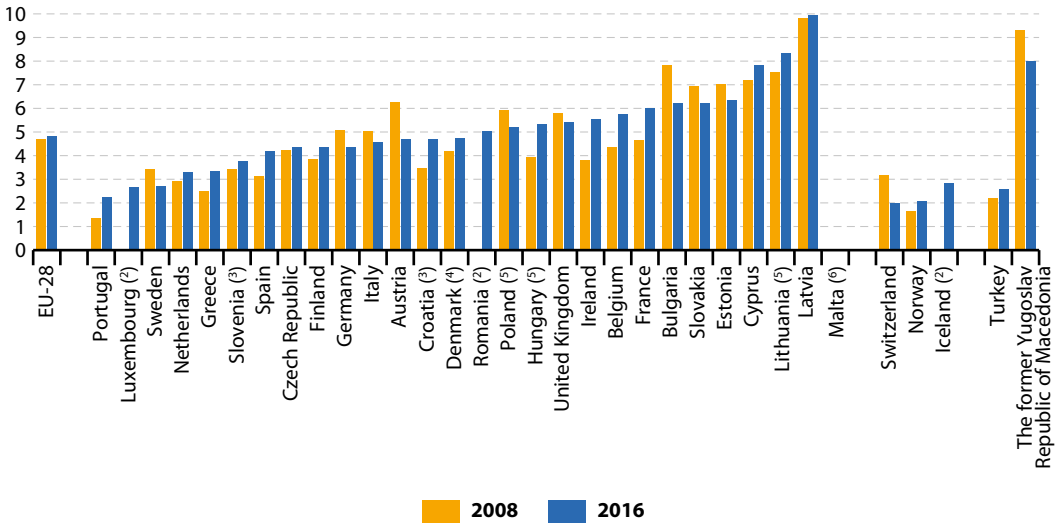
(1 000 persons)



Source: Cedefop 2016 skills forecast

([54]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012 (p. 18).

Figure 1.15: Over-qualification rate, by country, 2008 and 2016 ([1])
(%)



([1]) All countries: break in time series in 2014.
([2]) No 2008 data due to low reliability.
([3]) Data have low reliability.
([4]) Break in time series in 2016.
([5]) 2008 data have low reliability.
([6]) No data due to confidentiality (2008) and low reliability (2016).

Source: Eurostat (online data code: lfsa_egised)

for those hiring or looking for a job, it also affects most of the labour force, for example in times of weak employment demand more people take jobs below their qualification or skills level. This can hamper economic productivity and individual potential, especially when more highly educated people are trapped in jobs without opportunities to continually develop and use their skills ([55]). According to the Cedefop survey results, in 2014 about 25 % of highly qualified first job entrants were overqualified for their position ([56]). These figures challenge the labour market relevance of skills and qualifications ([57]). Furthermore, concerns have been raised that the intensified skill mismatch might undermine the long-term potential of the EU skilled labour force ([58]).

Figure 1.15 shows the over-qualification rate by country. Over-qualification refers to the situation where a person has a level of skill or education higher than is required for his or her job. Over-qualification may be measured in several ways. In this chapter, the over-qualification rate is defined as the share of persons with at least upper secondary education working in elementary occupations among all employed persons with the same level of education. Elementary occupations do not require any particular formal education but consist of simple and routine tasks which mainly require the use of hand-held tools and often some physical effort ([59]).

In 2016, 10.8 million people with at least upper secondary education worked in elementary occupations. This equals a share of 4.8 % of all those employed. Among Member States the share of overqualified workers ranged in 2016 from 9.9 % in Latvia to 2.2 % in Portugal (see Figure 1.15). In nine Member States the share declined between 2008 and 2016 and was the strongest in Austria

([55]) Cedefop, *#ESJsurvey INSIGHTS No 2 — Safeguarding education investments: Mitigating overqualification in the EU*, 2015.
([56]) Cedefop, *Matching skills and jobs in Europe, Insights from Cedefop's European skills and jobs survey*, 2015 (p. 2).
([57]) European Commission, *Education and Training Monitor 2015*, Brussels, 2015 (p.14).
([58]) See footnote 56.
([59]) ILO definition, see http://www.ilo.org/public/english/bureau/stat/isco/isco88/9.htm.

and Bulgaria, by 1.6 percentage points. At the other extreme, the share rose by more than one percentage point in five countries (Ireland, Belgium, France, Hungary, Croatia and Italy).

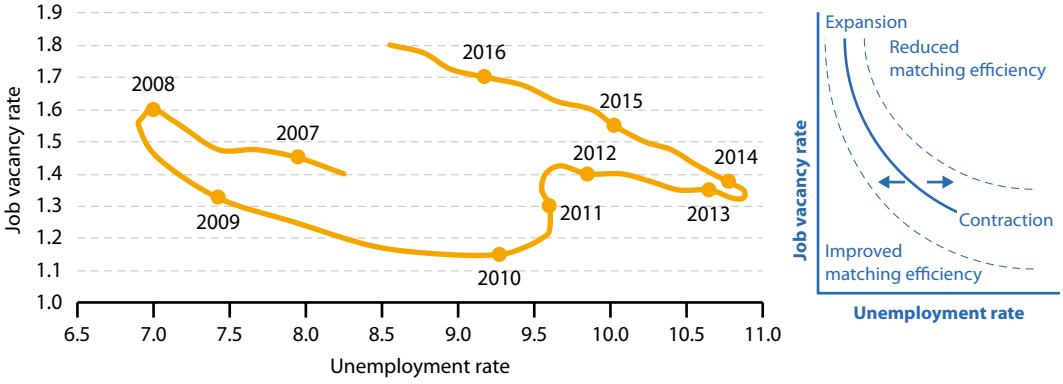
There are many reasons why people may have to take on a job below their qualification level. Young workers, mostly females, are at higher risk, although gender differences vary between countries. This higher risk may be attributed to competition for jobs and the relatively high proportion of young workers in non-standard employment ([60]). Tertiary education graduates who hold a degree in certain fields such as humanities, languages and arts, other social sciences, but also business and law are also more likely to work in occupations below their qualification level. In addition, the characteristics of a particular job can be a factor. Individuals in non-standard contract jobs and those employed in smaller-sized firms are more likely to see their education underutilised. Over-qualification is a wide-spread phenomena among international as well as EU-born migrants ([61]). This might be a result of migrants lacking country-specific skills to capitalise on their formal qualifications on the job (for example, language skills), but also imperfect recruitment policies and problems of recognition. Last but not least, overqualified people are more likely to have been unemployed before accepting their current job ([62]).

1.5.3 Signs of economic expansion with increasing job vacancies and decreasing unemployment

Job vacancy statistics provide an insight into the demand side of the labour market, in particular the unmet labour demand. A job vacancy is defined as a paid post that is newly created, unoccupied or about to become vacant. The employer must be taking active steps and be prepared to take further steps to find a suitable candidate from outside the enterprise. The employer must also intend to fill the position either immediately or within a specific time period. A vacant post that is only open to internal candidates is not treated as a 'job vacancy'.

Quarterly job vacancy statistics are used for business cycle analysis and for assessing mismatches in labour markets. Of particular interest is the relationship between vacancies and

Figure 1.16: Beveridge curve, EU-28, 2006–2016 ([1])
(%)



([1]) Data for 2006 (Q4) to 2010 (Q4) refer to EU-27; data points with years (as caption) refer to the first quarter of the year (data have been smoothed over 4 quarters).

Source: Eurostat (online data codes: jvs_q_nace2 and une_rt_q)

([60]) International Labour Organisation, *Skills mismatch in Europe: statistics brief*, Geneva, 2014 (p. 15).
([61]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 186).
([62]) Cedefop, *#ESJsurvey INSIGHTS No 2 — Safeguarding education investments: Mitigating overqualification in the EU*, 2015.

unemployment. The so-called Beveridge curve reflects their negative correlation (see Figure 1.16). During economic contractions there are few vacancies and high unemployment, while during expansions there are more vacancies and the unemployment rate is low.

Structural changes in the economy can cause the Beveridge curve to shift. During times of uneven growth across regions or industries — when labour supply and demand are not matched efficiently — the vacancy and unemployment rates can rise at the same time. Conversely, they can both decrease when the matching-efficiency of the labour market improves. This could be, for example, due to a better flow of job vacancy information thanks to the internet. Empirical analysis of the curve can be challenging because both movements along the curve and shifts can take place at the same time with different intensities.

Data for the period 2008 to 2009 show a movement along the Beveridge curve, mirroring the impacts of the economic crisis on job vacancies and unemployment. Since 2010, however, movements of the Beveridge curve itself point to a possibly substantial deterioration in the matching process: unemployment has been growing, while the job vacancy rate has remained stable or has also been increasing. This was the case in the fourth quarter of 2013 and the first quarter of 2014. This indicates unemployment has become more structural ([64]). This poorer matching at the European level may reflect disparities across Member States: most of the job vacancies have been created in countries with comparatively low unemployment. In the period 2014 to 2016 an upward movement along the Beveridge curve can be seen, illustrating an expansionary phase with falling unemployment rates and increasing vacancy rates. EU policies that address job vacancies aim to improve the functioning of the labour market by trying to match supply and demand more closely.

1.5.4 Slight easing in long-term unemployment

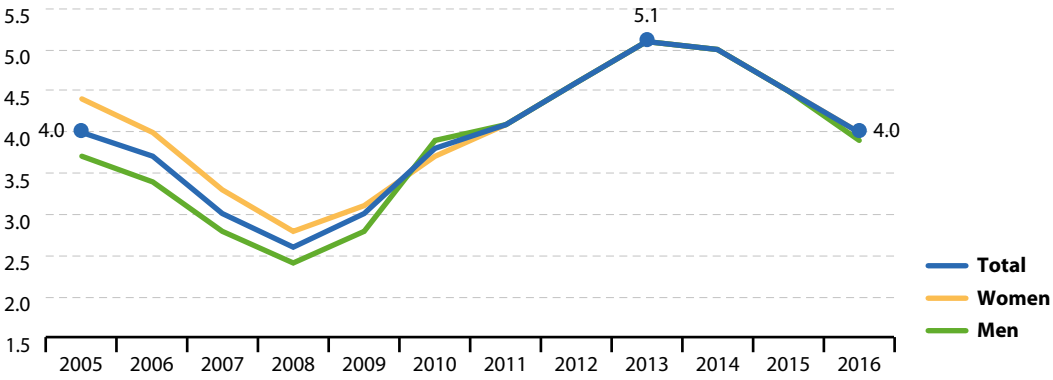
Long-term unemployment poses a serious challenge to the EU because of its negative social and financial implications for individuals and society as a whole (see Box 1.6). On an individual level, in the absence of an adequate and well-functioning social protection system, long-term unemployment could reduce income, increase the risk of poverty and social exclusion and affect health. It can also lead to deterioration of skills and

Box 1.6: Tackling long-term unemployment in the EU

Addressing long-term unemployment is a key employment challenge of the European Commission's jobs and growth strategy. On 15 February 2016, the Council adopted the Commission's Proposal for a Recommendation on the integration of the long-term unemployed in the labour market ([63]). The Council Recommendation puts forward three key steps: 1) encouraging the registration of long-term unemployed with an employment service; 2) providing each registered long-term unemployed with an individual in-depth assessment to identify their needs and potential at the very latest at 18 months of unemployment; and 3) offering a job integration agreement to all registered long-term unemployed at the very latest at 18 months. In October 2016 the employment ministers of all EU Member States endorsed a framework to monitor the implementation of the Council Recommendation. The first data collection will take place in mid-2017.

([63]) Council Recommendation of 15 February 2016 on the integration of the long-term unemployed into the labour market, (2016/C 67/01).
([64]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2011*, Luxembourg, Publications Office of the European Union, 2012 (p. 29).

Figure 1.17: Long-term unemployment rate, by sex, EU-28, 2005–2016
(%)



Source: Eurostat (online data code: tsdsc330)

human capital, hindering future employability, productivity and earnings ([65]). At the societal level, prolonged unemployment harms economic growth and social cohesion. High rates of long-term unemployment could have further and long-lasting consequences for the EU labour market and economy given that probability of moving from unemployment to inactivity increases with the time spent unemployed ([66]).

In 2016, 9.6 million people or 4 % of the active population in the EU were in long-term unemployment. In the last years since 2013, the unemployment rate dropped by 1.1 percentage points. Nevertheless, long-term unemployment emerges as the main employment legacy of the crisis as the proportion of long-term unemployed among all unemployed rose from 36.9 % in 2008 to 46.4 % in 2016.

1.6 Outlook towards 2020

Overall, in 2016 the EU was 3.9 percentage points below its employment target value of 75 %, to be met by 2020. According to the 2014 European Commission Communication 'Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth', even if all countries were to meet their national Europe 2020 targets, the overall EU employment rate would only grow to 74 %, just below the 2020 target ([67]). Ageing of the working population and the associated rise in economic dependency adds a sense of urgency to the need to improve the functioning of the labour market. The EU risks undermining its growth potential and future prosperity unless it is 'able to put more people to work and ensure they work more productively and for a longer time, in line with the increase in life expectancy and healthy life years' ([68]). While a large share of young and well-educated people will be available to work (also see the chapter on 'Education', page 107), achieving the Europe 2020 employment target will require greater use of the potential labour force, including women, older people and so far inactive adults such as migrants ([69]).

([65]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 26).
([66]) Ibid.
([67]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM (2014) 130 final, 2014 (p. 12).
([68]) Id., p. 9.
([69]) Id., p. 12.

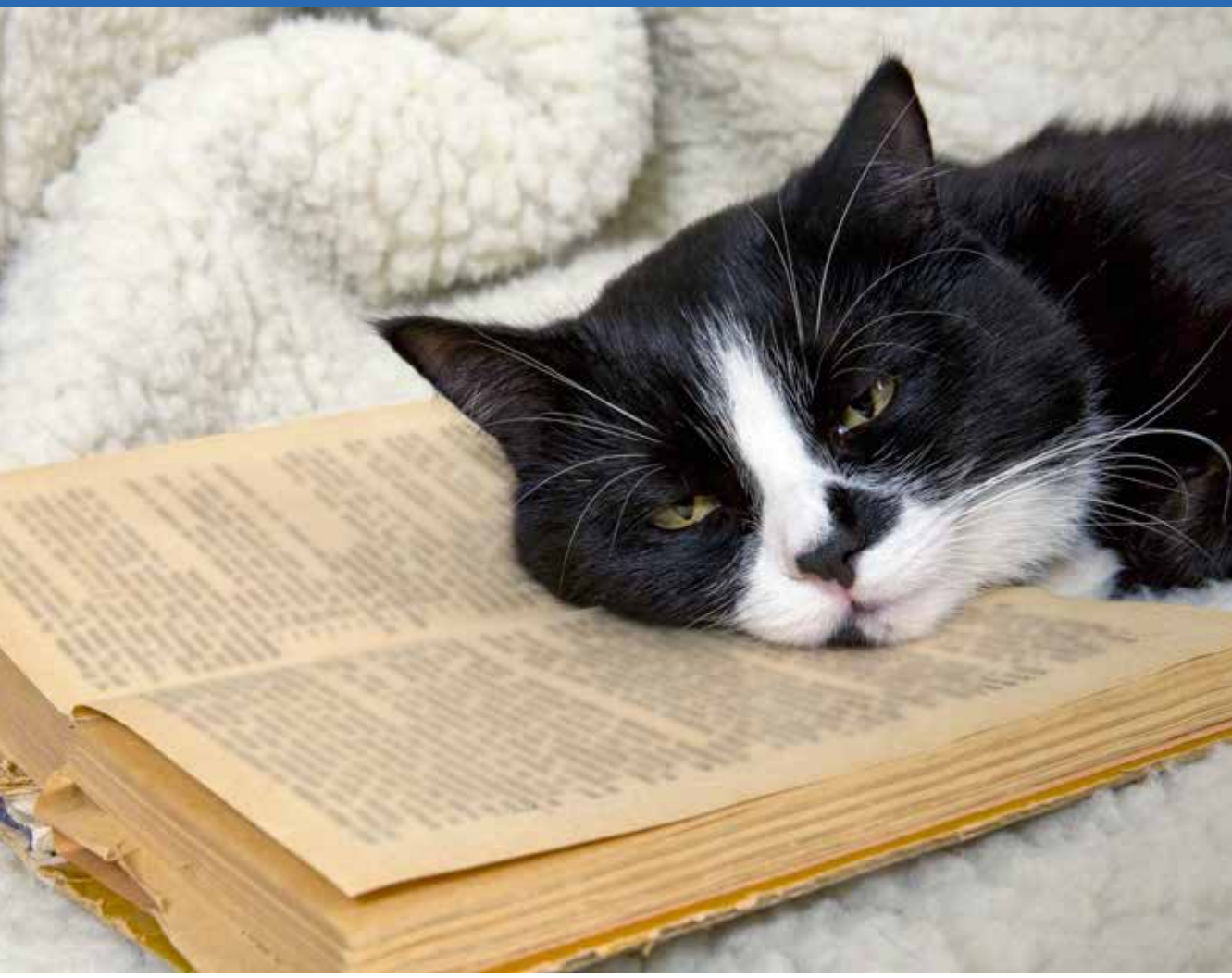
The EU youth unemployment rate is more than double the overall unemployment rate (18.7 % compared with 8.6 %). Bringing young people into the labour market is crucial to avoid eroding competence or insufficient skill acquisition ([70]). Increasing the relevance of education and supporting a secure transition from education to employment — as emphasised in the flagship initiatives 'An Agenda for new skills and jobs' ([71]) and 'Youth on the Move' ([72]), and the EU employment package 'Towards a job-rich recovery' ([73]) — are key policy steps towards improving the employment prospects of young people. The 'Youth Employment Package' proposes specific recommendations on how to fight youth unemployment and enable young people to gain access to jobs, traineeships or apprenticeships. In particular it includes a Recommendation to Member States to implement a Youth Guarantee to ensure that all young people up to age 25 receive a quality offer of a job, continued education, an apprenticeship or a traineeship within four months of leaving formal education or becoming unemployed. The implementation of a Youth Guarantee scheme receives EU funding support. The 'Youth Employment Initiative' reinforces and accelerates measures outlined in the Youth Employment Package, particularly focusing on young people not in education, employment or training in regions with a youth unemployment rate above 25 %.

Increasing the labour force participation of women would require comprehensive family policies, which improve the compatibility of child-rearing and employment. Universal access to high-quality childcare services for children, availability of part-time work and access to parental leave are proven as particularly effective in this respect ([74]). Highly relevant EU actions in this direction also include the promotion of new forms of flexibility and security on the labour market as outlined in the flagship initiative 'An Agenda for new skills and jobs: A European contribution towards full employment' ([75]) and addressed by the EU employment package 'Towards a job-rich recovery' ([76]).

Integrating older people and migrants into the labour market might be challenging because a large portion tend to have low education levels ([77]). Against future projections for increased demand for high-skilled labour, these groups are therefore more likely to join the less skilled part of the labour force. In this respect, it would be imperative for Member States to design and put in place active labour market policies combined with targeted policy measures for lifelong learning and comprehensive integration. Enabling mobile people to better capitalise on their formal qualifications would also enhance their employability and improve growth prospects.

([70]) European Commission (Directorate-General for Employment, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2015*, Luxembourg, Publications Office of the European Union, 2016 (p. 28).
([71]) European Commission, *An Agenda for new skills and jobs: A European contribution towards full employment*, COM(2010) 682 final, 2010 (p. 8).
([72]) European Commission, *Youth on the Move: An initiative to unleash the potential of young people to achieve smart, sustainable and inclusive growth in the European Union*, COM(2010) 477 final, 2010 (p. 3).
([73]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, 2012 (p. 10).
([74]) See footnote 70, p. 16.
([75]) See footnote 71, p. 5.
([76]) See footnote 73.
([77]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, 2014 (p. 12).

2 R&D and innovation



2.1 R&D and innovation — why do they matter?

Research and development (R&D) and innovation are key policy components of the Europe 2020 strategy. Innovative products and services not only contribute to the strategy's smart growth goal but also to its inclusiveness and sustainability objectives. Introducing new ideas to the market promotes industrial competitiveness, job creation, labour productivity and the efficient use of resources.

R&D and innovation contribute to a well-functioning knowledge-based economy. Most importantly, they are central to providing the scientific and technical solutions needed to meet global societal challenges such as climate change and clean energy, security and active and healthy ageing. For instance, technological advances in materials science and digitalisation, are driving rapid progress in renewable energy and energy efficiency as well as other sectors important for sustainable development and mitigating climate change such as transport, construction, manufacturing, agriculture and consumer goods ([1]). However, development of new technologies alone will not be enough to solve many of the 'grand' societal challenges. Fundamental transformations in businesses and manufacturing processes, provision of services, the way society organises itself and other non-technological innovations will be equally important.

The challenges facing society also threaten the well-being of the population and can have dire social, economic and environmental implications inside and outside the EU. Research and innovation can not only help in addressing these challenges, but also in exploiting the new market opportunities they offer.

Europe 2020 strategy target on R&D

The Europe 2020 strategy sets the target of 'improving the conditions for innovation, research and development' ([2]), in particular with the aim of 'increasing combined public and private investment in R&D to 3 % of GDP' by 2020 ([3]).

A number of important EU policy strategies and initiatives address such win-win situations. Horizon 2020 — the EU's research and innovation programme for the period 2014 to 2020 — is helping to bring ideas from the lab to the market by providing nearly EUR 75 billion ([4]) of funding for research projects aimed at tackling societal challenges, generating excellence in science and fostering industrial leadership ([5]).

The EU Action Plan for the Circular Economy ([6]), included in the Circular Economy package, proposes actions that will contribute to 'closing the loop' of product life cycles through greater recycling and re-use, and will bring benefits for both the environment and the economy. Similarly, the Roadmap to a Resource Efficient Europe ([7]) supports the shift towards a resource-efficient, low-carbon economy, while bringing new economic opportunities, sources of growth and jobs, and increased competitiveness through improved efficiency.

As highlighted in the European Commission publication Open Innovation, Open Science and

([1]) The Global Commission on the Economy and Climate, *Better Growth Better Climate*, Chapter 7, 2014, Washington, (p. 3).
([2]) European Council conclusions 17 June 2010, EUCO 13/10, Brussels, 2010.
([3]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, Brussels, 2014 (p. 12).
([4]) Set in current prices.
([5]) Regulation (EU) 2015/1017 of the European Parliament and the Council of 25 June 2015 on the European Fund for Strategic Investments, the European Investment Advisory Hub and the European Investment Project Portal and amending Regulations (EU) No 1291/2013 and (EU) No 1316/2013 — the European Fund for Strategic Investments.
([6]) European Commission, *Closing the loop — An EU action plan for the Circular Economy*, COM(2015) 614 final, Brussels, 2015.
([7]) European Commission, *Roadmap to a resource Efficient Europe*, COM (2011) 571 final, Brussels, 2015 (p. 4).

R&D and innovation in the EU

Gross domestic expenditure on R&D (GERD)

rose from 1.84 % of GDP in 2008 → to 2.03 % of GDP in 2015

2020 target: 3 % of GDP

see page 59

GERD by sectors of performance
business enterprise sector, % of GDP

2008	2015
1.16	1.30

see page 61

Tertiary graduates in science and technology
per 1 000 inhabitants aged 20-29 years

2008	2015
14.5	19.1

see page 69

Employment in knowledge-intensive activities
% of total employment

2008	2015
32.4	36.0

see page 70

Total R&D personnel and researchers, full-time equivalents
% of total employment

2008	2015
1.1	1.3

see page 72

Total innovative enterprises
% of total number of enterprise

2014
49.1

see page 74

Innovative enterprises engaged in any type of co-operation
% of product and/or process innovative enterprises

2014
33.1

see page 75

Patent applications to the EPO by priority year
thousands

2008	2012
57.1	56.8

see page 76

High-tech exports to outside the EU
million euro

2008	2015
201.7	304.3

see page 78

Open to the World ([8]), digital technologies are fundamentally transforming the way science operates and businesses innovate — 'new knowledge is now created through global collaborations involving thousands of people from across the world and from all walks of life'. The ability of the EU to continue transferring knowledge into commercial and social gains would depend on how it adapts to this changing reality. In recognition of this, the European Commissioner for research, Carlos Moedas, has set three goals for EU research and innovation policy, which aim to make science and innovation more open, collaborative and global. The European Commission is already taking actions in this direction by developing a European Science Cloud, increasing access to the scientific data generated by Horizon 2020 projects and undertaking new international research co-operation agreements with Ukraine, Tunisia, China and South American countries, to name a few examples.

The analysis in this chapter focuses on the headline indicator 'gross domestic expenditure on R&D', which monitors the strategy's research and development target. Fundamental enabling factors that drive innovation are also discussed. These are the first links in the innovation chain and include R&D investment in EU Member States and its distribution across regions and the various public and private societal actors. The role of education, in particular tertiary education in science and technology, in providing the necessary human capital for the knowledge-based society is also highlighted. In addition, the economy's capacity for R&D and innovation in terms of a skilled workforce is examined. This is followed by a look at the EU's performance concerning innovative business frontrunners and the technological output at the end of the innovation chain in terms of commercialisation and internationalisation. These indicators complement the 'R&D intensity' headline indicator, which is an input measure, with measures referring to the output and outcome dimensions of innovation.

The importance of R&D and innovation for fulfilling the ambitions of the Europe 2020 strategy is evident in the close interlinkages between them and the strategy's other objectives. The R&D target is closely related to the strategy's tertiary educational attainment and employment targets (see the chapters on 'Employment', page 25, and 'Education', page 107).

Public investment in R&D generates the knowledge base and talent that higher education and innovative companies need. Higher public investment in R&D also leverages private investment in research and innovation, providing new jobs in business and academia and ultimately increasing demand for scientists and researchers on the labour market. R&D investment spurs innovation, which contributes to industrial competitiveness and job creation.

The Europe 2020 target on R&D is also linked to the strategy's climate change and energy targets (see the chapter on 'Climate change and energy', page 81). In particular, the transition to a green and low-carbon economy and adaptation to climate change will require significant innovation, from small incremental changes to major technological breakthroughs.

([8]) European Commission, *Open Innovation, Open Science, Open to the World*, Brussels, 2016 (p. 8).

2.2 Investment in research and development in the EU

Gross domestic expenditure on R&D as a percentage of GDP in the EU stagnated at 2.03 % between 2013 and 2015, halting what had been a period of slow but rising growth since 2008. Up until that point, R&D intensity had been relatively stable at around 1.8 % between 2002 and 2007. As a result, the gap between the current performance and the 3 % target has yet to be closed.

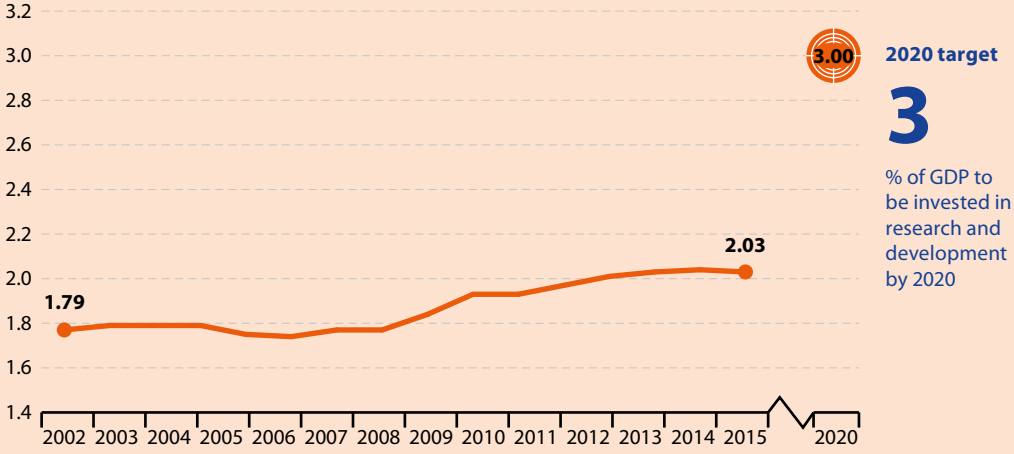
The business sector remains the main source of finance for R&D activities in the EU and it has recorded the highest increase since 2002. Although the higher education and government sectors have lower R&D shares and have been growing at a slower pace, they have been more resilient to economic fluctuations.

R&D expenditure is highest in northern and western European countries, which are also characterised by predominantly business-financed R&D.

The regions with the highest R&D intensity in the EU are found in Germany, the United Kingdom, the Nordic countries, Austria, France and Belgium. The Province Brabant Wallon in Belgium has by far the highest R&D intensity in the EU — 11.4 %.

Europe 2020 headline indicator

Figure 2.1: Gross domestic expenditure on R&D, EU-28, 2002–2015 ([1])
(% of GDP)



([1]) Data for 2002 are estimates, 2015 data are provisional.

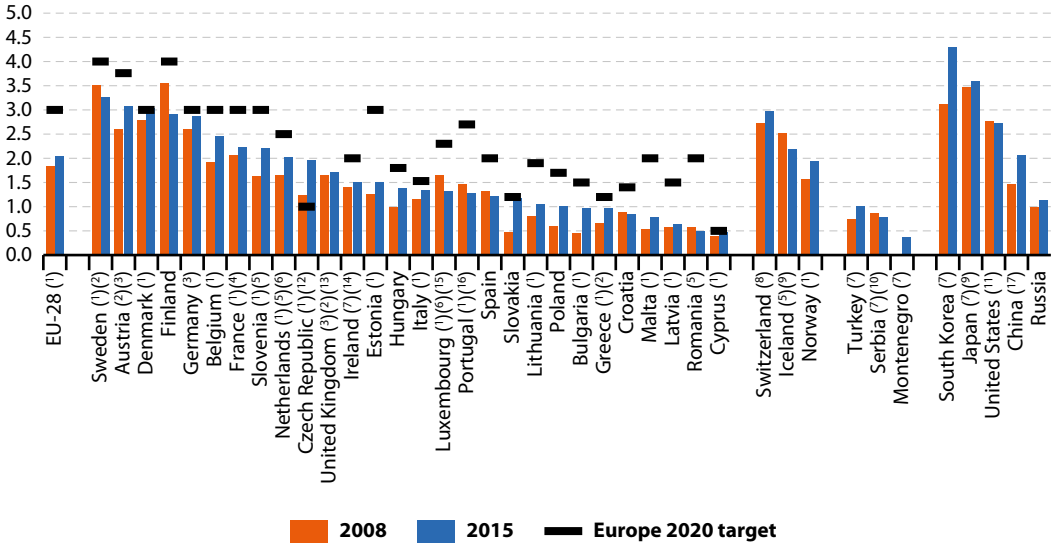
Source: Eurostat (online data code: t2020_20)

The headline indicator **gross domestic expenditure on R&D**, also referred to as R&D intensity, shows the proportion of gross domestic product (GDP) dedicated to research and development ([9]).

After a period of somewhat continuous growth between 2007 and 2014, R&D expenditure in the EU reached 2.04 % of GDP in 2014, up from 1.77 % in 2007. However, progress has been slow and the most recent figures point to a stagnation, which has moved the EU further away from its 3 % target. The slow increase since 2007 contrasts with the prolonged stagnation experienced between 2002 and 2007, when EU R&D expenditure remained more or less stable at around 1.77 % of GDP. Overall, R&D intensity emerged stronger from the economic crisis as a result of depressed GDP growth and increased public funding for R&D expenditure in many Member States.

At the global level, the EU's R&D intensity is still lagging behind other advanced economies, such as the United States, Japan and South Korea, with only the best performing Member States surpassing the United States (see Figure 2.2). The EU's relative position in the global R&D landscape has also weakened because of a rapid rise of R&D expenditure in China. In 2014, China overtook the EU by spending 2.05 % of its GDP on R&D.

Figure 2.2: Gross domestic expenditure on R&D, by country, 2008 and 2015
(% of GDP)



(1) 2015 data are provisional.
(2) 2008 data are estimates.
(3) 2015 data are provisional and/or estimates.
(4) Break in time series in 2010.
(5) Break in time series in 2011.
(6) Break in time series in 2012.
(7) 2014 data (instead of 2015).
(8) 2012 data (instead of 2015).
(9) Break in time series in 2013.
(10) 2009 data (instead of 2008).
(11) 2013 data (instead of 2015); data for 2013 are provisional and definition differs.
(12) Target refers to the public sector only.
(13) No national target.
(14) Target about 2.5 % of GNP (approximately 2 % of GDP).
(15) Target 2.3–2.6 %.
(16) Target 2.7–3.3 %.
(17) There is a break in series between 2009 and the previous years.
Source: UNESCO.

Source: Eurostat (online data code: t2020_20)

(9) Research and experimental development (R&D) comprises creative work undertaken on a systematic basis to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications' (*Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development*, 6th edition, p. 63).

2.2.1 R&D spending has risen in three quarters of Member States since 2008

Across the EU, R&D intensity ranged from 0.46 % to 3.26 % in 2015 (see Figure 2.2). Northern Member States Finland and Sweden did not only share a pattern of high expenditure, they also had the most ambitious national targets. In 2015, Denmark slightly exceeded its R&D target of 3 %, while Slovakia, Cyprus and Germany came very close to meeting their targets of 1.2 %, 0.5 % and 3 %, respectively.

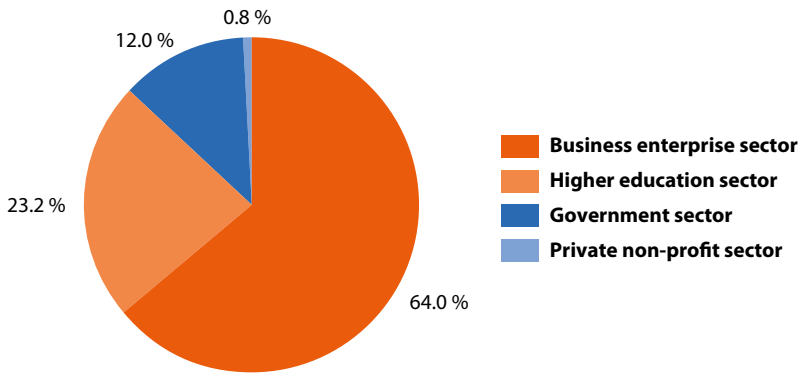
Lower R&D intensity levels, below 1 %, were mostly recorded in eastern and southern Member States. Patterns in R&D investment, in particular business R&D spending, between countries generally mirror the industrial structure of economies, differences in the knowledge intensity of sectors and their research capabilities ([10]).

R&D intensity increased in most Member States between 2008 and 2015. This was mainly due to a slowdown in GDP growth, along with a rise in nominal government spending on R&D in many EU countries. Nevertheless, countries with very high levels of R&D intensity (Sweden and Finland), moderate levels (Luxembourg and Portugal) and very low levels (Croatia and Romania) alike suffered negative trends in R&D expenditure in that period. It is to be noted that Finland was a leader in R&D intensity in 2008, but its spending contracted to below 3.00 % of GDP in 2015. The negative trends experienced in both Finland and Sweden could be partly attributed to difficulties in their information and communication technology (ICT) sectors ([11]). Growth in R&D expenditure between 2008 and 2015 was most pronounced in some central and eastern European economies that generally have low levels of spending, such as Slovakia and the Czech Republic.

2.2.2 Business enterprise is the largest R&D performing sector

R&D activities are carried out by four main institutional sectors, namely business enterprise, government, higher education and the private non-profit sector (see Box 2.1). Figure 2.3 shows how **R&D expenditure was distributed between these four sectors** in 2015. The business enterprise sector, which accounted for 64.0 % of total R&D expenditure in the EU (EUR 191.2 billion), was the largest R&D performing sector. Next was the higher education sector, which spent almost three times less on R&D activities than the business sector (EUR 69.4 billion).

Figure 2.3: R&D expenditure, by sectors of performance, EU-28, 2015 ([1])
(%)



([1]) Provisional data.

Source: Eurostat (online data code: rd_e_gerdtot)

([10]) Reinstaller, A., Unterlass, F., 2012, *Comparing business R&D across countries over time: a decomposition exercise using data for the EU27*, Applied Economics Letter 19, 1143–1148.
([11]) European Commission, *Science, Research and Innovation Performance of the EU*, Brussels 2016 (p. 43).

Box 2.1: The four R&D sectors

Four main institutional sectors carry out R&D: business enterprise, government, higher education and private non-profit.

The business enterprise sector comprises all firms, organisations and institutions whose primary activity is the production of goods or services (other than higher education) for sale to the general public at an economically significant price. It also includes the private non-profit institutions that mainly serve them (while excluding those serving households).

The government sector includes all departments, offices and other bodies that furnish, but normally do not sell to the community; those common services other than higher education, that cannot otherwise be conveniently and economically provided, as well as those that administer the state and the economic and social policy of the community. It also includes non-profit institutions controlled and mainly financed by government (excluding the higher education sector). Public enterprises are included in the business enterprise sector.

The higher education sector encompasses all universities, colleges of technology and other institutions of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher education institutions.

The private non-profit sector includes non-market, private non-profit institutions serving households (the general public) and private individuals or households ([12]).

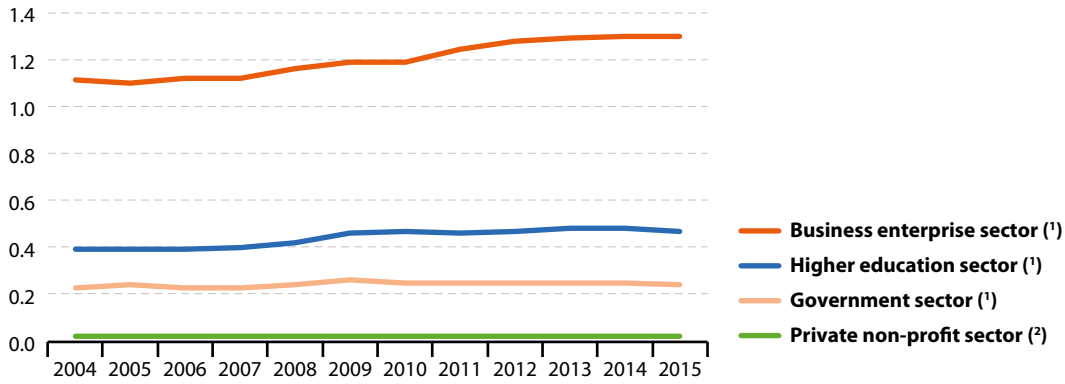
Although the share of the government sector in total R&D expenditure was more modest at 12.0 % (EUR 35.7 billion), its role remains important, especially for the long-term stability of R&D expenditure. This includes performing 'far from the market' research ([13]) and research that is of social or environmental importance (for example, health, quality of life, environment and defence). It also includes establishing the basis for R&D activities and compensating for reduced business R&D expenditure during economic downturns to help avoid a decline in the build-up of capital stocks and harm to long-term productivity growth ([14]). The smallest sector performing R&D was the private non-profit sector (EUR 2.5 billion), making its share almost negligible at less than 1 %.

All R&D sectors in the EU experienced increases in their R&D expenditure as a percentage of GDP between 2002 and 2015, except for the private non-profit sector (see Figure 2.4). Business R&D intensity grew the most, by 0.15 percentage points. Apart from stalling in 2007 and 2010, its R&D intensity has been rising slowly since 2005. The higher education sector's R&D intensity rose at just half the pace over the same period, while R&D performed in the government sector grew marginally by only 0.01 percentage points.

As Table 2.1 shows, annual changes in total R&D expenditure are mainly influenced by R&D trends in the business sector. This is not surprising as the private sector is the largest in terms of R&D performance. Business R&D expenditure typically follows the cyclical patterns of GDP growth. Indeed, the sharpest drop in total business R&D spending coincided with the slump in GDP growth in 2009, whereas its peaks in 2006 and 2011 occurred during or after economic upturns. Apart from brief interruptions in 2009 and 2013, business R&D

([12]) For some countries, the private non-profit sector is considered together with the government sector.
([13]) The market does not provide sufficient incentives for this type of research due to the non-appropriable, public good, intangible character of knowledge and the risky nature of research. For more information see: OECD.STI policy profiles. Public research policy: https://www.oecd.org/sti/outlook/e-outlook/stipolicyprofiles/competencestoinnovate/publicresearchpolicy.htm
([14]) OECD, *Public investment in R&D in reaction to economic crises — A longitudinal study for OECD countries*, 2016.

Figure 2.4: Gross domestic expenditure on R&D, by sectors of performance, EU-28, 2004–2015
(% of GDP)



(1) Data for 2015 are provisional.
(2) Data are estimates and/or provisional (whole time series).
Source: Eurostat (online data code: rd_e_gerdtot)

Table 2.1: Gross domestic expenditure on R&D, by sector of performance, EU-28, 2006–2015 (1)
(% change over previous year) (2)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
All sectors	4.8	3.4	4.4	– 0.4	1.9	4.0	1.5	0.5	2.6	1.8
Business enterprise sector	5.7	3.7	3.8	– 2.9	2.1	6.2	2.1	0.5	3.1	2.0
Government sector	1.4	0.7	4.3	2.2	– 0.5	0.7	– 0.2	0.3	0.5	2.5
Higher education sector	3.7	4.3	6.3	4.4	2.6	0.8	0.7	1.0	2.0	1.1
Private non-profit sector	16.2	0.0	2.3	2.3	6.7	– 10.4	– 2.3	– 9.5	5.3	0.0

(1) Data for 'Private non-profit sector' are estimates (whole time series).
(2) Calculation based on million purchasing power standards (PPS) at 2005 prices.
Source: Eurostat (online data code: rd_e_gerdtot)

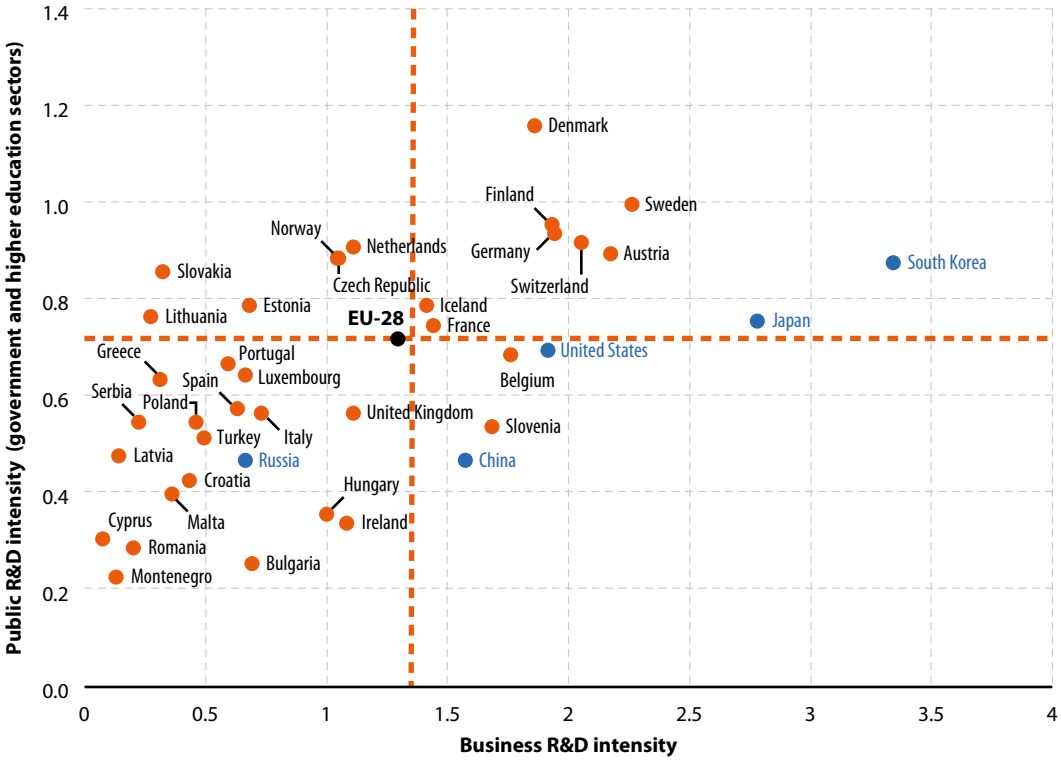
spending has increased annually at a relatively high rate. In contrast, public sector R&D expenditure (higher education and government) has been less cyclical and has grown more slowly. However, there have been exceptions. The education sector outpaced business in terms of R&D spending growth over the period 2007 to 2010 and the government sector's R&D expenditure grew faster from 2008 to 2009 and more recently in 2015. Overall, for all sectors annual growth in R&D expenditure has still not recovered to the levels seen before 2009.

In many Member States, direct government R&D funding has been complemented by indirect support for business R&D in the form of tax incentives. Such incentives have played either an important or a dominant role in addition to direct funding for business R&D in half of the Member States. These countries also increased their use of R&D tax incentives during the crisis years ([15]).

Another important source of R&D finance has come from European funds, in particular through the EU Research Framework Programme and the EU Structural Funds. According to recent estimates, 20% of the increase in public R&D expenditure between 2007 and 2012 could be attributed to 'funding from abroad', mainly from the EU budget ([16]), which was an important addition to the 69% increase that

([15]) European Commission, *Science, Research and Innovation Performance of the EU*, Brussels 2016 (p. 143).
([16]) Id., p. 28.

Figure 2.5: Gross domestic expenditure on R&D, by sectors of performance, by country, 2015
(% of GDP)



Note: SE: provisional data for business enterprise and private non-profit sector; SI, BG, BE, AT, UK, FR, DK, IT, CZ, LU, MT, PT, EE, EL and CY: data are estimates and/or provisional; DE, NL, LV and NO: data for business enterprise, government and higher education sector are provisional and/or estimates; DE, NL, HR and US: definition differs for private non-profit sector; IE, TU, ME, RS, KR, JO, CN: 2014 data for business enterprise sector; IE: data for higher education sector are estimates; HU and US: definition differs for business enterprise sectors; HU, DE, NL, HR, SK, CH and ME: definition differs for government sector; LT: Data for business enterprise sector are provisional; CH, TU, ME, RS, KR, JO and CN: 2014 data for higher education sector; CH: 2012 data for private non-profit sector; ME, RS, KR, JO: 2014 data for private non-profit sector; TU, ME, RS, KR, JO and CN: 2014 data for government sector; HU, ME and US: definition differs for higher education sector; US: 2013 data for all sectors.

Source: Eurostat (online data code: rd_e_gerdtot)

came from national public spending. Although most funds from EU research programmes flow to large, research-intensive Member States that joined the EU before 2004, they have made substantial contributions to public funding in several small Member States with low R&D capacity that joined more recently ([17]). There has also been an important shift in the use of Structural Funds, with a growing share being channelled into R&D spending ([18]).

To illustrate country differences in gross domestic expenditure on R&D by sector of performance, Figure 2.5 presents business sector R&D expenditure as a share of GDP on the horizontal axis and public sector (higher education and government) R&D expenditure as a share of GDP on the vertical axis. The business sector is the largest R&D sector of performance in the most research-intensive countries. In the least research-intensive countries, such as the Baltic countries

([17]) European Commission, *Science, Research and Innovation Performance of the EU*, Brussels 2016 (p. 145).
([18]) Id., p. 160.

and some southern and eastern Member States, the public sector — higher education and government — tends to account for the most R&D expenditure. There are, however, exceptions to this pattern in the east (Hungary, Bulgaria and Croatia) and the south (Italy and Spain). In general, low business sector R&D intensity in Member States indicates that the broader innovation system and framework conditions for this type of investment are still insufficiently attractive ([19]). Although the public R&D system drives the generation of knowledge and talent needed by innovative enterprises, it is only through business investment that the full impacts of R&D can be realised. Business R&D integrates and transforms available knowledge into commercially viable technologies and innovation such as greener products, processes and services that enable higher labour productivity, industrial competitiveness, resource efficiency and reduced environmental impacts.

2.2.3 R&D intensity concentrated in regions in Germany, the United Kingdom, Nordic countries, Austria, France and Belgium

When looking at the regional distribution of **R&D intensity**, it can be seen that most of the EU's research activity is concentrated in 30 NUTS 2 regions (see Map 1). These regions, located mostly in Germany (10 regions), the United Kingdom (five regions), Sweden and Austria (four regions each), Finland (three regions), Belgium (two regions), Denmark and France (one region each), reported R&D intensity above 3.00 %. Some research-intensive 'clusters' are also apparent, in particular: a band of research-intensive regions running from Finland, through southern Sweden into Denmark; another band from the United Kingdom, through Belgium into southern Germany; and a final band going from Slovenia, through Austria into southern France and northern Spain. This geographical concentration of R&D activities is a common phenomenon. R&D clusters often develop around academic institutions or specific high-technology industrial activities and knowledge-based services, where they could benefit from a favourable environment and knowledge sharing. Due to clusters many regions attract new start-ups and highly qualified personnel and develop a competitive advantage in specialised activities.

Three regions in the EU appear to have particularly high R&D intensities. In 2013, Germany's Stuttgart and Braunschweig regions spent 6 % and 7.3 % of their GDP on R&D, respectively. Even more ambitious was Belgian's Brabant Wallon province where R&D spending peaked at 11.4 % of GDP — almost six times higher than the EU average. However, this figure can partly be explained by the high number of commuters that travel from Brabant Wallon to the Brussels regions, increasing the GDP of Brussels and lowering the GDP of Brabant Wallon.

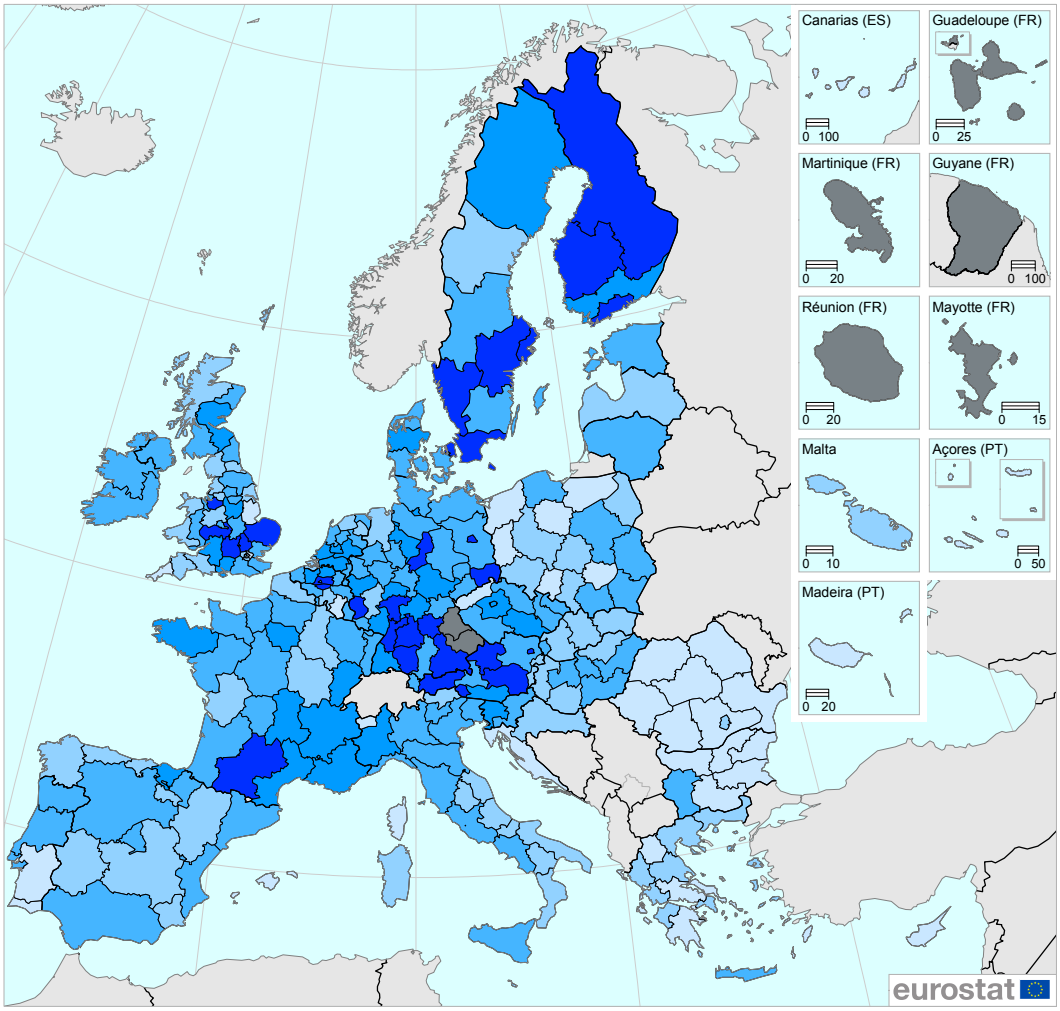
At the other end of the scale, the 38 regions with R&D intensity below 0.5 % of GDP mainly belong to southern or central Member States: Romania (seven regions), Poland (six regions), Bulgaria and Greece (five regions each), Portugal, Spain and the United Kingdom (three regions each), Belgium, France, Croatia, Italy, the Czech Republic and Finland (one each).

Capital regions recorded the highest levels of R&D intensity in 12 multi-regional Member States. In addition, in 20 countries, the capital regions' R&D intensity exceeded the national average but was not necessarily the highest in the country. Only Belgium, the Netherlands and Greece went against this trend, with capital regions' R&D intensity below the national average. Regional disparities in R&D intensity within countries were largest in the United Kingdom, Belgium and Spain and smallest in Slovenia, Hungary, Croatia and the Netherlands.

Changes in R&D intensity over time are presented in Map 2. Of the 269 regions for which data are available, 62 experienced a decline in R&D intensity between 2007 and 2014. This decline was below one percentage point in all regions except for four regions in the United Kingdom, namely Essex, Lancashire, Cheshire and Kent. In the remaining regions, the increase in R&D intensity ranged between 0.01 percentage points and 4.63 percentage points (Belgian Brabant Wallon).

([19]) European Commission, *Innovation Union Competitiveness Report 2013*, Brussels 2013 (p. 38).

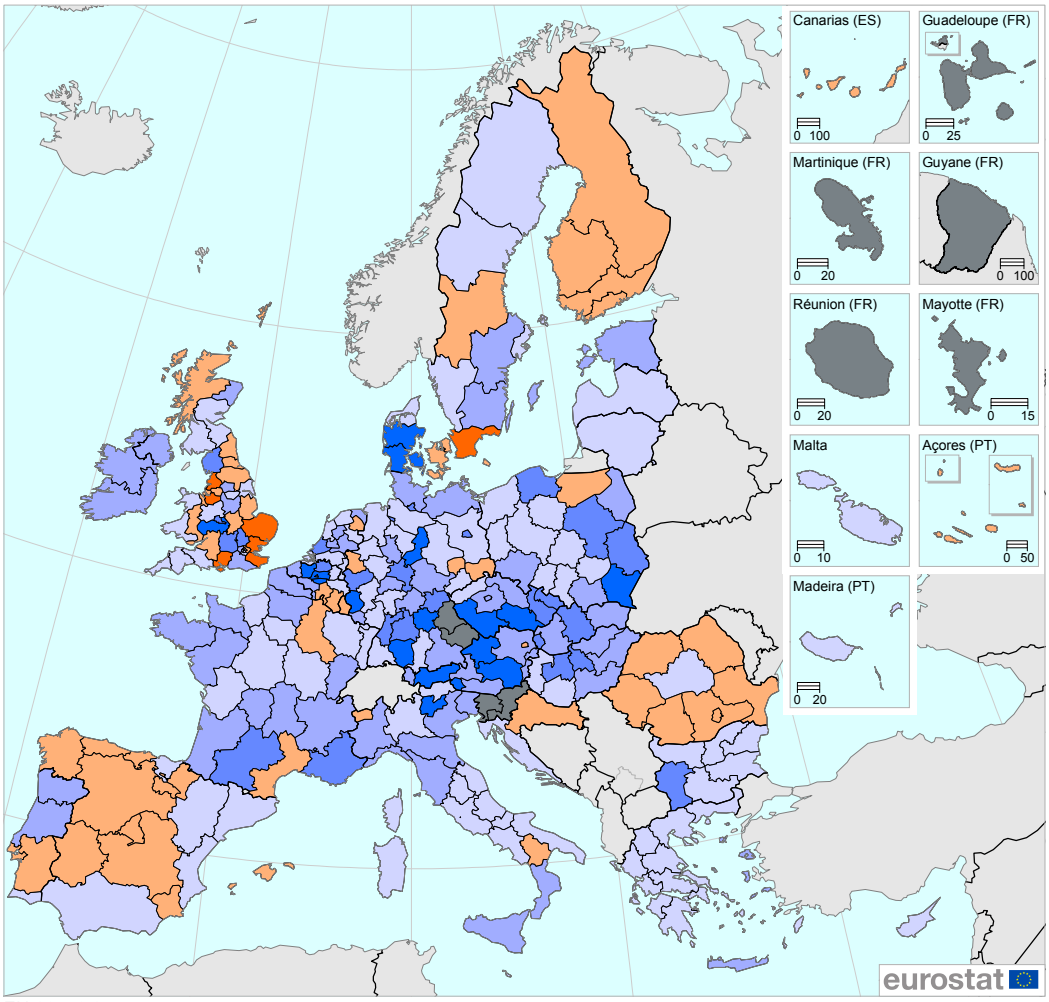
Map 2.1: Gross domestic expenditure on R&D, by NUTS 2 regions, 2014 (1)
(% of GDP)



(1) Data for BE, DE, IE, EL, FR, AT, FI and SE refer to 2013 instead of 2014. Data for IT and UK are estimates.

Source: Eurostat (online data code: rd_e_gerdreg)

Map 2.2: Change in gross domestic expenditure on R&D, by NUTS 2 regions, 2007–2014 (1)
(percentage points difference between 2013 and 2007, % of GDP)



(1) Change 2007–2013 for BE, DE (except 2009–2013 for regions Brandenburg, Chemnitz and Leipzig), IE, FR, AT, FI (except 2009–2013 for regions Helsinki-Uusimaa and Etelä-Suomi) and SE; Change 2008–2014 for HR; Change 2009–2014 for UK regions Cheshire and Merseyside and 2011–2014 for the London regions; Change 2011–2013 for EL (all 13 regions); estimated data for NL and LU (2007), IT (2014) and UK (all years); breaks in time series for AT (2013) and PT (2008).

Source: Eurostat (online data code: rd_e_gerdreg)

2.3 Building the knowledge base for research and innovation

The EU increased its output of tertiary graduates in science and technology by 32 % between 2008 and 2015. Despite this progress women are still underrepresented in this field of study across all Member States.

Although employment in knowledge-intensive activities has increased in almost all Member States since 2008, the United States and Japan still outperform the EU in this respect. Countries with large financial and ICT sectors relative to their GDP report the highest employment in knowledge-intensive activities in the EU.

Since 2002, the share of R&D personnel in the labour force has been slowly but continuously increasing, reaching 1.2 % of total employment in 2015. The business sector employs more than half of this workforce.

Knowledge and skills are crucial for gaining new scientific and technological expertise and for building an economy's capacity to absorb and use this knowledge (see Box 2.2). R&D expenditure is a vital enabling factor for human capital because it supports knowledge generation and skills development. Highly skilled human resources in turn are necessary for the EU's research and innovation capacity and competitiveness. However, current skill mismatches ([20]) pose a challenge for the supply of a highly qualified workforce at a time of increasing and rapidly shifting technological needs and an ageing population. According to projections from the European Centre for the Development of Vocational Training (Cedefop), around 16 million more highly qualified people will be needed in the EU by 2025 ([21]). To meet this demand and avoid a potential skills gap, the EU would

Box 2.2: The knowledge triangle: education facilitates research and innovation

Education is the ultimate way of building up human capital and is strongly linked to research and innovation. These three concepts, which are central drivers of a knowledge-based society, form the so-called knowledge triangle ([22]). This concept brings together education; academic research and knowledge production; and innovation, and highlights the mutual benefits to be gained from strong links between the three. To realise a cohesive European Research Area (ERA), education, research and innovation need to be strongly interlinked.

([20]) Skill mismatches occur when the distribution of skills in the labour force does not match with the qualifications required by the labour market. For trends in skill mismatches in the EU see: ILO. 2014. *Skills mismatch in Europe*, Statistics Brief, Geneva, 2014.

([21]) See http://www.cedefop.europa.eu/en/publications-and-resources/data-visualisations/job-opportunities?locale=EN&dataSource=SFMJ&plot=crossCountry&question=01.+JobOpportunities&onlyEU=0

([22]) European Institute of Innovation and Technology, *Catalysing innovation in the knowledge triangle: practices from the EIT knowledge and innovation communities*, 2012 (p. 8).

need a high number of tertiary graduates (also see the chapters on 'Employment', page 25, and 'Education', page 107).

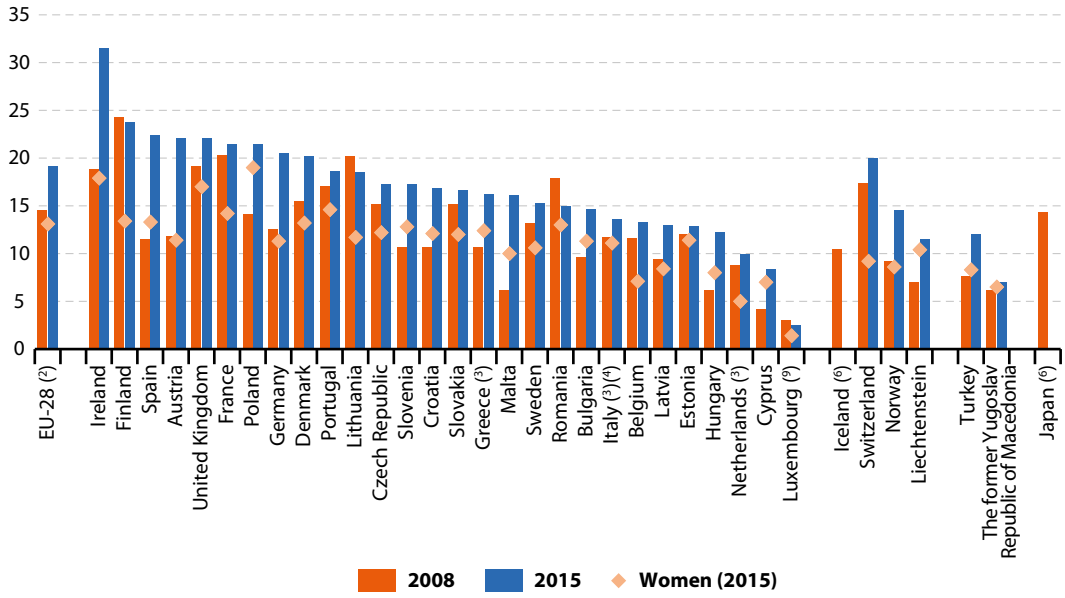
2.3.1 Number of science and technology graduates in the EU is increasing, but women remain underrepresented

A well-functioning research and innovation system is important to promote excellence in education and skills development and ensure a sufficient supply of (post)graduates in science, technology, engineering and mathematics. Increasing the number of science graduates and jobs in knowledge-intensive activities would help to create a solid base for the EU knowledge economy and contribute to Europe 2020's objectives by fostering the EU's innovation capacity, economic strength and employment.

Despite some challenges regarding science education — in particular disparities in basic science literacy and quality of science education, as well as gender imbalances across countries and regions — the EU has a good basic education system ([23]). And the number of EU students that **graduate from tertiary education in science and technology** has been growing.

Figure 2.6 shows how this trend has developed in recent years. Between 2008 and 2015 the share of tertiary graduates in science and technology grew by 32 %, from 14.5 graduates per 1 000 people aged 20 to 29 to 19.1 graduates per 1 000 in the same age group. However, these figures need to be interpreted with caution because the growth in the number of science and technology graduates might be somewhat overstated by the Bologna effect. This occurs when tertiary

Figure 2.6: Tertiary graduates in science and technology, by country, 2008 and 2015 ([1])
(Graduates per 1 000 population aged 20 to 29 years)



([1]) 2008 data based on ISCED97; 2014 data based on ISCED 2011. Full title of the 2014 indicator 'graduates in tertiary education, in science, mathematics, computing, engineering, manufacturing, construction'.
([2]) 2015 data are estimates.
([3]) 2014 data instead of 2015.
([4]) Definition differs for 2008.
([5]) 2011 data instead of 2008.
([6]) No data for 2015.

Source: Eurostat (online data codes: tps00188 and educ_uoe_grad04)

([23]) European Commission, *Europe 2020 Flagship Initiative Innovation Union*, SEC (2010) 1161, Brussels, 2011 (p. 11 and 36).

graduates who complete a bachelor's and then a master's degree are counted twice. As a result, the trend in terms of the absolute number of graduates has not been as positive.

At the Member State level the trend varies considerably (see Figure 2.6). In 2015, the number of science and technology graduates ranged from about 31.5 per 1 000 inhabitants in Ireland to 8.3 per 1 000 inhabitants in Cyprus and 2.5 per 1 000 inhabitants in Luxembourg (2011 data). The very low ratio of graduates in science and technology in Luxembourg and Cyprus might be the result of a high proportion of students pursuing their studies abroad. Foreign graduates tend to push up the ratio in the country where they studied and pull it down in their home country. In all Member States, except Finland, Portugal, Romania and Luxembourg, the rates of tertiary graduates in science and technology have increased since 2008. Between 2008 and 2015, the tertiary graduate rate in Malta more than doubled, while the rate grew twice in Hungary and almost doubled in Cyprus and Spain.

Empowering women in tertiary education and enhancing their employment opportunities in the R&D sector is also an essential part of the EU's research and innovation policy. Ensuring gender equality and integrating the gender dimension in research and innovation is one of the European Commission's main five priorities set out in the 2012 Communication 'A Reinforced European Research Area Partnership for Excellence and Growth' ([24]) and a key element of the Horizon 2020 programme. Improving gender equality in science education can promote research, innovation and ultimately long-term growth by increasing the number of scientists and engineers. It can also help to reduce occupational segmentation in the labour force and improve gender equity in the labour market ([25]).

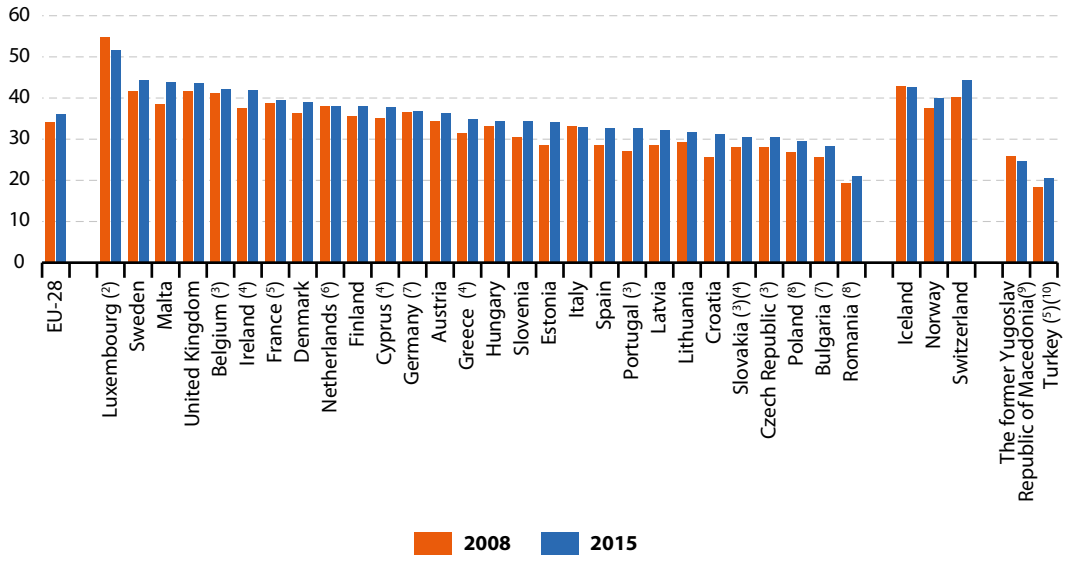
Despite growth in the share of female tertiary graduates in science over the past few years, women are still under-represented in the science and technology fields in all Member States, especially those with the highest output of graduates in these fields (see Figure 2.6). This might be explained by the fact women still engage in different fields of study than men. For instance, men are more than two times more likely than women to choose a degree in engineering, manufacturing and construction, while women are twice as likely to pursue an education degree ([26]). It is generally accepted that, among other factors, differences in the educational pathways have some impact on gender segregation in employment. Occupational segregation, understood as under- or over-representation of a given group in occupations or sectors (for example, the female-dominated primary education and care sector and male-dominated technical occupations), may contribute to wage inequalities and threatens to exacerbate labour and skill shortages. The share of women in science and technology fields declines further at the postgraduate level and even more so after they transition to the workplace: in 2012 women accounted for 47 % of PhD graduates (ISCED 6: post-graduate programmes above master's level ([27])) but made up only 33 % of researchers and 21 % of top-level researchers (grade A) ([28]).

2.3.2 More than one third of the EU labour force is employed in knowledge-intensive activities

Pursuit of innovation is not an end in itself. It can have far-reaching impacts because it drives productivity, supports long-term growth and generates high-quality jobs. Innovation can also shift a country's economic structure towards more knowledge-intensive activities with higher added value ([29]). This structural change has

([24]) European Commission, *A Reinforced European Research Area Partnership for Excellence and Growth*, COM(2012) 392 final, Brussels, 2012.
([25]) OECD, *Report on the Gender Initiative: Gender Equality in Education, Employment and Entrepreneurship*, Meeting of the OECD Council at Ministerial Level Paris, 25–26 May 2011 (p. 25).
([26]) European Commission, *She Figures 2015* (p. 5).
([27]) ISCED 1997 classifications used.
([28]) See footnote 26, p. 5–6.
([29]) Knowledge-intensive activities are defined based on the level of tertiary educated people within sectors. An activity is classified as knowledge-intensive if employed tertiary educated persons (according to ISCED97, levels 5–6) represent more than 33 % of total employment in that activity.

Figure 2.7: Employment in knowledge-intensive activities, by country, 2008 and 2015 ([1])
(% of total employment)



([1]) Break in time series for EU-28 and all countries except for Turkey and The former Yugoslav Republic of Macedonia.
([2]) Break in time series in 2009 and 2015.
([3]) Break in time series in 2011.
([4]) Break in time series in 2009.
([5]) Break in time series in 2014.
([6]) Break in time series in 2010, 2011 and 2013.
([7]) Break in time series in 2010 and 2011.
([8]) Break in time series in 2010.
([9]) 2011 data instead of 2008.
([10]) 2009 data instead of 2008

Source: Eurostat (online data code: htec_kia_emp2)

important implications for employment as it helps accommodate and stimulate the development of a highly skilled labour force. Therefore, the indicator on employment in knowledge-intensive activities as a percentage of total employment shows how the supply of highly skilled labour feeds into a country's economic structure.

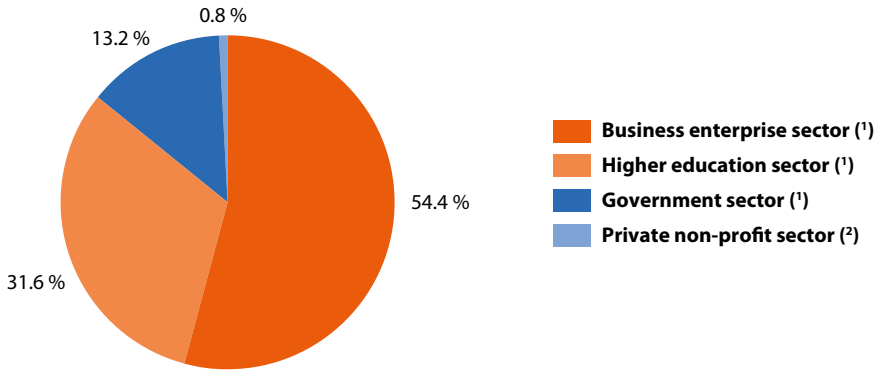
Employment in knowledge-intensive activities accounts for more than one third of total employment in the EU. Between 2008 and 2015 this share increased slightly, from 34.2 % to 36.0 %.

As Figure 2.7 shows, countries in eastern and southern Europe, except for Cyprus and Malta, recorded employment shares in knowledge-intensive activities below the EU average. Luxembourg led the ranking, with more than half of workers employed in fields requiring a high level of knowledge and education. This may be explained by the importance of financial services to the economy. A further five countries, most of them in northern Europe and with large financial or ICT sectors relative to their GDP, also recorded rates above 40 %.

Between 2008 and 2015 the employment share in knowledge-intensive activities increased in all Member States, except for Luxembourg and Italy, which experienced a 3.1 and 0.2 percentage point reduction, respectively. The highest increases of more than five percentage points were in Estonia as well as in some small southern Member States (Croatia, Portugal and Malta).

These findings should take into consideration that a growing share of employment in knowledge-intensive activities might not necessarily indicate a country is moving towards a more knowledge-based economy. It could also be the result of employment in non-knowledge-intensive sectors decreasing more than employment in knowledge-intensive activities. In fact, this seems to be the case for countries such as Greece, Spain, Italy and

Figure 2.8: R&D personnel, by sectors of performance, EU-28, 2015
(%)



(1) Provisional data.
(2) 2014 data instead of 2015; 2014 data are estimates.
Source: Eurostat (online data code: rd_p_persocc)

the Netherlands, which experienced reductions in both total employment and in employment in knowledge-intensive activities in absolute values between 2008 and 2015 ([30]). On the other hand, increased employment in sectors not considered knowledge-intensive would lead to lower values for the analysed indicator, even if this employment is the result of significant investment in innovation in these sectors ([31]).

In 2015, 44.2 % of women employed in the EU were working in knowledge-intensive activities. In contrast, the share was only 29.1 % for men ([32]). While half of all men employed in knowledge-intensive activities were working in the business sector, this was the case for only 30 % of women.

Improvement in the EU's scientific tertiary education output has been complemented, to a varying extent, by national measures intended to attract a highly qualified workforce and human resources, including women, to science and research ([33]). At the EU level, **R&D personnel** — researchers and other staff employed directly in R&D — accounted for 1.3 % of the labour force in 2015 ([34]). The business enterprise sector was the biggest employer of R&D personnel, providing jobs for more than half of this workforce. The higher education sector was the second most important employer of R&D professionals.

Similar to the evolution of R&D intensity, the share of R&D personnel in the labour force increased marginally between 2002 and 2015 (0.26 percentage points). This trend was mainly driven by the business enterprise sector, where the share of R&D personnel grew by 0.17 percentage points. The higher education and the government sectors showed much smaller increases of 0.08 and 0.02 percentage points, respectively. The private non-profit sector maintained its almost negligible share of 0.01 % between 2002 and 2014.

([30]) Source: Eurostat (online data codes: lfsi_emp_a and htec_kia_emp2).
([31]) Janger, J., Schubert, T., Andries, P., Rammer, C. and Hoskens, M., *The EU 2020 innovation indicator: A step forward in measuring innovation outputs and outcomes?*, Research Policy 46 (2017) 30–42.
([32]) Source: Eurostat (online data code: htec_kia_emp2).
([33]) European Commission, *European Research Area, Facts and Figures for 2014*, Luxembourg, 2014 (p. 22).
([34]) 2015 data is provisional. Source: Eurostat (online data code: rd_p_perslf).

2.4 Introducing innovative ideas to the market: the role of businesses

Almost half of the EU's enterprises reported some kind of innovation activity in 2014, which was similar to the levels observed in 2012. Member States with relatively a high GDP per capita, in particular Germany and Luxembourg, had the highest number of innovative enterprises.

A third of the EU's innovative enterprises were engaged in some form of co-operation with other enterprises or institutions during the period 2012–2014. The United Kingdom led the ranking, with more than 60 % of its innovative enterprises reporting co-operation activities.

Since 2008, the number of patent applications to the European Patent Office has stabilised at about 57 000. This contrasts with the upward trend in patent filings before the economic downturn.

High-tech exports to outside the EU doubled between 2007 and 2015. This growth was mainly driven by increases in the aerospace and pharmacy sectors.

A dynamic business environment is essential for the promotion and diffusion of innovation. The challenge is to make use of R&D by fostering entrepreneurship and creativity to trigger innovation and economic competitiveness. Therefore, measures targeting knowledge diffusion and absorption of ideas and innovations, for example, through the creation of technology markets and licensing schemes, are just as important as investment in knowledge generation (see Box 2.4, page 77). The higher the uptake and use of ideas from R&D, the more likely innovative players are to invest in future knowledge generation through increased private R&D expenditure. Innovators also help to create a more dynamic innovation system. In many cases they contribute to the structural and technological changes needed to adapt to new circumstances and challenges. An example is the depletion of fossil fuels and the resulting transition towards more renewable energy sources.

Progress in achieving knowledge diffusion and absorption can be measured through data on the number of innovative companies, patent applications and exports of high-tech products, among others. Other attempts to measure innovation include composite indices such as the European Innovation Scoreboard and the Eco-Innovation Index.

The European Innovation Scoreboard is a policy instrument used by the European Commission to compare Member States' research and innovation performance. Based on a composite indicator, known as the summary innovation index, it forms a comprehensive benchmarking and monitoring system of research and innovation trends in Europe ([35]).

Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across a product's whole life cycle, bringing both economic and

([35]) The European Innovation Scoreboard analyses the innovation system of EU Member States through a set of 25 indicators broken down into eight dimensions looking at human resources, research systems, finance and support, firm investments, linkages and entrepreneurship, intellectual assets, innovators and economic effects. In the resulting summary innovation index, Member States are classified into four groups, based on their average innovation performances: 'innovation leaders' have an innovation performance well above the EU average, 'innovation followers' group comprises countries whose performance is above or close to the EU average, 'moderate innovators' have a performance below that of the EU average, and 'modest innovators' whose performance is well below the EU average (see European Commission, *Innovation Union Scoreboard 2016*, 2016 Brussels).

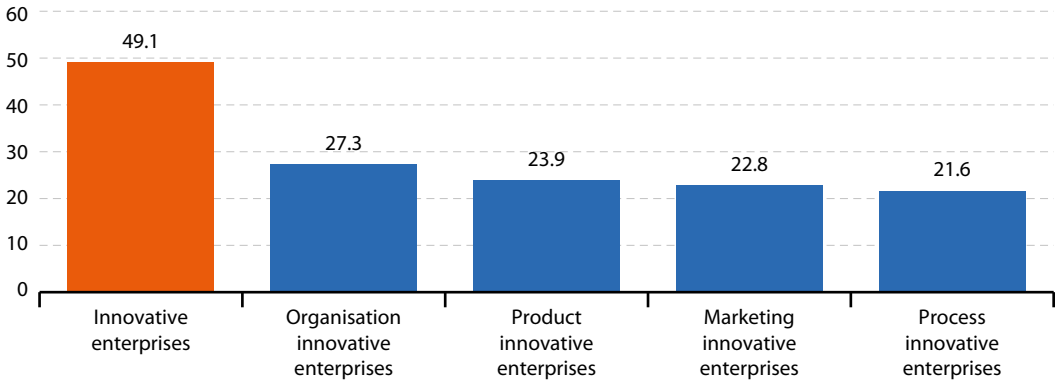
environmental benefits. Environmental benefits include improved resource productivity, in particular better material and energy efficiency, lower greenhouse gas (GHG) emissions and reduced waste generation, which is beneficial for companies and end users. All types of innovation can become eco-innovation as long as they bring environmental benefits. Eco-innovation can, therefore, introduce to the market a new good or service, process, organisational change or marketing method. It can also have implications at the wider economic and societal level (for example, new urban design or new transportation systems) ([36]).

The Eco-Innovation Scoreboard ([37]) is a policy tool that helps measure eco-innovation performance and assess whether the EU and its Member States are moving towards smart and sustainable growth, as requested by the Europe 2020 strategy ([38]).

2.4.1 Almost half of EU enterprises carry out innovation activities

Almost half (49.1 %) of EU enterprises reported innovation activity between 2012 and 2014. The share has remained relatively stable since the previous biennial Community Innovation Survey (CIS) in 2012 (48.9 %) ([39]) (see Figure 2.9). The share of innovative enterprises is broadly linked with GDP per capita levels. By far, **the highest share of innovative enterprises** was observed in Germany (67.0 %), but other countries with high GDP per capita and productivity levels such as France, and the Benelux and northern European countries also seemed to provide a favourable environment for innovative business activities (55 % or more innovative enterprises) ([40]). These countries also share a high proportion of medium-high and high-tech manufacturing companies or a high proportion of knowledge-intensive

Figure 2.9: Enterprises by type of innovation, EU-28, 2014
(% of the total number of enterprises)



Source: Eurostat (online data code: inn_cis9_type)

([36]) Eco-innovation Observatory, *Introducing eco-innovation: from incremental changes to systemic transformations*, 2011.
([37]) Eco-Innovation Scoreboard (Eco-IS) on the DG Environment website: http://ec.europa.eu/environment/ecoap/scoreboard_en
([38]) The Eco-IS shows how well individual countries perform in different dimensions of eco-innovation compared with the EU average. It is based on 16 indicators grouped in to five thematic areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes. In the index, Member States are ranked in relation to the EU average of 100.
([39]) The Community Innovation Survey (CIS) is a survey of innovation activities of enterprises in Member States. The survey collects information about product and process innovation as well as organisational and marketing innovation and other key variables. Most questions cover new or significantly improved goods or services or the implementation of new or significantly improved processes, logistics or distribution methods. It produces a broad set of indicators on innovation activities, innovation expenditure, public funding, sources of information for innovation, innovation co-operation, organisational and marketing innovation and on strategies and obstacles for reaching the enterprises' goals. For further information, see the Statistics Explained article on innovation statistics available on the Eurostat website: http://ec.europa.eu/eurostat/statistics-explained/index.php/Innovation_statistics
([40]) Eurostat (online data code: inn_cis9_type).

services (for example, ICT and finance). The share of innovative enterprises therefore seems to be also linked to economic structures. Similar to R&D intensity, a west-east divide could be observed, with businesses in eastern European countries with below EU-average income per capita recording the lowest innovation activity.

Innovative companies can be distinguished by the type of innovation they pursue. Figure 2.9 shows how different business strategies lead to different innovation types such as product, process, organisational or marketing innovation (see Box 2.3). More than a quarter (27.3 %) of EU enterprises reported an organisational innovation that involved implementing a new method in the enterprise's business practices, workplace organisation or external relations. Product innovation related to the launch of new or significantly improved goods or services was the second most common innovation activity reported by enterprises (23.9 %).

Complex innovations with the highest potential for boosting productivity and growth often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. Innovation co-operation, which measures among other things the flow of knowledge between public research institutions and enterprises and between enterprises and other enterprises, provides an important indication of enterprises' innovation activity.

A third (33.1 %) of EU enterprises that conducted product and process innovation activities were also engaged in innovation co-operation arrangements during 2012 to 2014 (see Figure 2.10). The United Kingdom stands out in this context with 61.4 % of innovative enterprises involved in co-operation activities — double the EU average. At the other end of the scale, enterprises in some of the southern European countries were less likely to participate in

Box 2.3: Types of innovation

Innovation is a broad concept that encompasses the capacity of a company, economy or society to adapt to changing environments and circumstances. As outlined in the Community Innovation Survey 2014 ([41]) and the Oslo Manual ([42]) it comprises a variety of aspects:

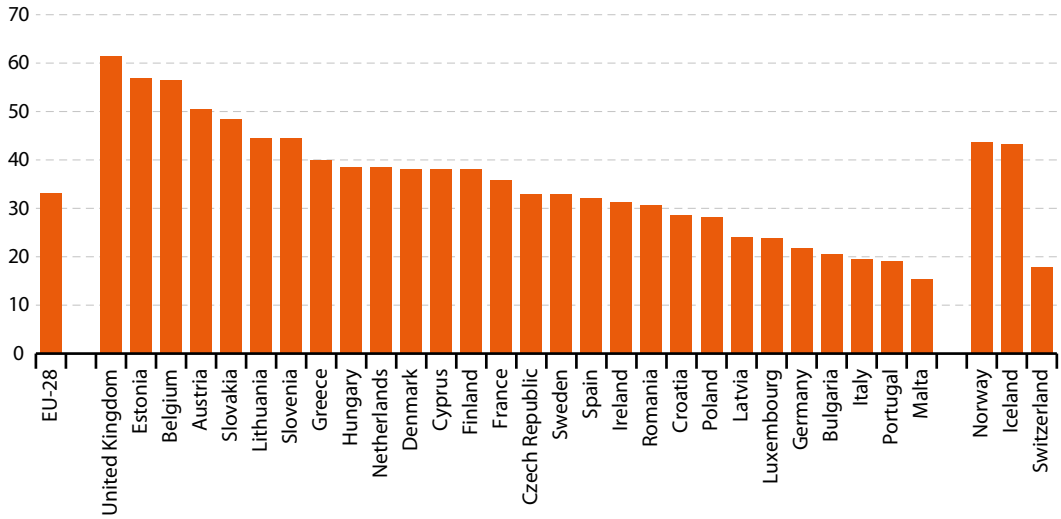
- **Product innovation**: introduction of new or significantly improved goods or services.
- **Process innovation**: significant changes in production and delivery methods.
- **Organisational innovation**: changes in the way business or manufacturing practices are organised.
- **Marketing innovation**: the introduction of new marketing methods (concept or strategy).

Other innovation types, elaborated in a Commission Staff Working Document ([43]), include:

- **User-driven innovation**: innovation that draws heavily on knowledge inputs from customers and markets.
- **Open innovation**: changes in the way companies and other organisations access and exploit knowledge to innovate.
- **Social innovation**: innovations in the way society organises itself, especially the different ways that the public sector serves the needs of society.

([41]) *The Community Innovation Survey 2014, The harmonised survey questionnaire*, 23 July 2014.
([42]) OECD and Eurostat, *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data*. Third Edition, Paris, 2005 (p. 1 onwards).
([43]) European Commission, *Commission staff working document — A rationale for action accompanying the Europe 2020 Flagship Initiative Innovation Union*, SEC (2010) 1161 final, Brussels, 2010 (p. 6).

Figure 2.10: Innovative enterprises engaged in any type of co-operation, by country, 2014
(% of product and/or process innovative enterprises)



Source: Eurostat (online data code: inn_cis9_coop)

collaborative knowledge creation. Interestingly, the EU leader in innovative enterprises — Germany — showed a comparatively low share of enterprises engaged in collaboration. In contrast, some Baltic and eastern European countries with a relatively low share of innovative enterprises displayed above average innovation co-operation.

2.4.2 Stagnation in the number of EU patent applications since 2008

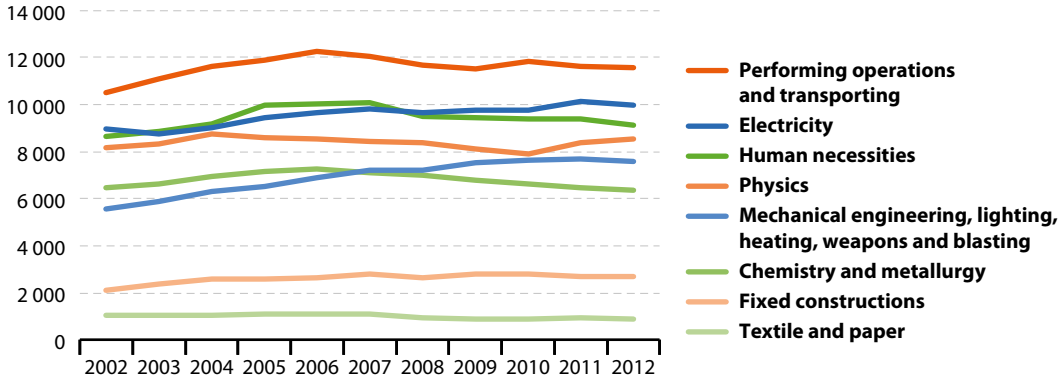
The more cutting-edge knowledge is produced, the more likely it is to spill over into new products and private R&D activities. In this regard, patents provide a valuable measure of the exploitation of research results and of the inventiveness of countries, regions and enterprises. Patenting has a strategic role in supporting the Europe 2020 strategy. Introducing innovative ideas to the market through patenting helps improve the EU's competitiveness and productivity, which underlie economic growth and employment, and brings long-term benefits to the economy at large through the wide diffusion of knowledge.

In 2012, **the total number of patent applications to the European Patent Office (EPO)** was 10 % higher compared to the level a decade earlier. Patent applications had been steadily increasing until 2008, but have since stabilised at around 57 000. The largest decrease in patent filings coincided with the slowdown in economic growth in 2008 and later in 2012. This might be explained by the fact that many industries reduce their R&D budgets and expenditure on the application and maintenance of intellectual property rights during an economic downturn ([44]).

The most prolific technology fields in terms of EU patents are performing operations and transporting, electricity and human necessities (see Figure 2.11). These three sectors accounted for half of all EU patent applications in 2012 (54 %). Trends for total patent filings in the individual sectors tended to follow the overall trend. The sectors experiencing the most growth in the number of patent applications between 2002 and 2012 were mechanical engineering, lighting,

([44]) Benoliel, D. and Gishboliner, M., *The Effect of Economic Crises on Patenting Activity Across Countries*, 14 Chicago — Kent Journal of Intellectual Property 316, 2015 (p. 323).

Figure 2.11: Patent applications to the European Patent Office (EPO) by priority year by international patent classification (IPC) sections and classes, EU-28, 2002–2012
(number)



Source: Eurostat (online data code: pat_ep_nipc)

Box 2.4: Relationships between R&D, innovation and patents

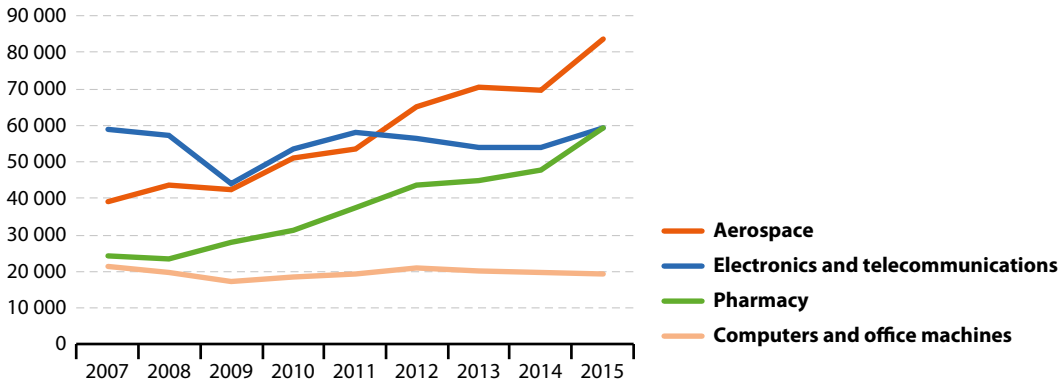
Patents are legal instruments that encourage companies to innovate by conferring some exclusive rights to inventors or assignees in return for the disclosure of an invention. According to literature ([45]), a company's propensity to file patents is influenced by three factors: R&D efforts, strategic considerations and the competitive environment. One of the trade-offs for filing a patent application is that it excludes other parties from using the invention, unless permitted by the patent holder, and therefore limits its diffusion into society ([46]).

Since the 1990s, a trend of increased propensity to patent without a corresponding growth in R&D expenditure has been experienced in the United States and in the EU. A large variety of factors could have contributed to this trend including time-lags, knowledge spill-overs, different accounting of R&D costs (for example, innovation activity not recorded as R&D spending), higher number of applications filed on the international level, lower quality of patents and novelty of inventions, easier granting of patents in the US system and others. At company level, the increase in patents might also reflect economic requirements such as the need for asset creation by small companies.

Next to patent filing, the extent to which patents are actually used for economic and societal purposes remains of major importance. Patent counts might not truly reflect innovation output as patent technologies are not always brought into use and a considerable share of innovation outputs are not patentable at all ([47]). Licensing has largely been used to alleviate the risk that innovations are not used and that they are patented for reasons other than increasing productivity and further innovation (for example, guaranteeing protection from rivals) ([48]).

([45]) Harhoff, D., Hall, B.H., von Graevenitz, G., Hoisl, K., Wagner, S., Gambardella, A. and Giuri, P., *The strategic use of patents and its implications for enterprise and competition policies*, Final Report to DG Enterprise, July 8, 2007 (p. 7).
([46]) Gambardella, A., Giuri, P. and Mariani, M., *Study on evaluating the knowledge economy: what are patents actually worth? The value of patents for today's economy and society*, Project ETD/2004/IM/E3/77 for DG Internal Market, 2006 (p. 28, 31).
([47]) Janger, J., et al, *The EU 2020 innovation indicator: A step forward in measuring innovation outputs and outcomes?*, Research Policy 46, 2017 (p. 30–42).
([48]) See footnote 46.

Figure 2.12: High-tech exports by high-tech group of products, EU-28, 2007–2015
(EUR million)



Source: Eurostat (online data code: htec_trd_group4)

heating, weapons and blasting (28 %) and fixed constructions (36 %).

2.4.3 High-tech exports to non-EU countries have doubled since 2007

Beyond turning research results into tangible applications, innovative businesses compete globally to sell their high-tech products on the world market. The volume of **high-tech trade** provides an indication of EU enterprises' ability to commercialise their R&D and innovation outputs globally. It also reflects the specialisation of countries in producing medium and high-tech products that result from innovation and contributes to an economy's balance of trade and international competitiveness. The creation, exploitation and commercialisation of high-tech products is associated with high value added for the economy and knowledge-intensive and remunerative jobs. Therefore, high-tech trade also contributes to the Europe 2020 strategy's priorities for smart and inclusive growth.

Between 2007 and 2015 the value of high-tech exports to outside the EU grew by more than 50 % in nominal terms, from EUR 199 billion to EUR 304 billion. This was a result of continuous growth, which was interrupted only briefly during the economic downturn in 2009. The main drivers behind the development of EU's high-tech exports since 2007 were the pharmacy and aerospace sectors, which increased by 145 % and 114 %, respectively. In particular, the EUR 45 billion increase in exports of aerospace high-tech accounted for almost half of the growth in total exports to countries outside the EU. Within high-tech exports, aerospace was also the product group with the highest level of exports (EUR 84 billion), followed by pharmacy (EUR 60 billion) and electronics and telecommunications (EUR 59 billion). In terms of destination, the United States and China were the main importers of EU high-tech products in 2015, with shares of 26 % and 10 %, respectively ([49]).

([49]) Eurostat, Statistics Explained, *Production and international trade in high-tech products*, Data extracted in December 2016.

2.5 Outlook towards 2020

The Europe 2020 strategy tries to overcome the economic crisis and its impacts by addressing the structural weaknesses of the EU economy. It also attempts to create the conditions for smarter growth through more effective investments in education, research and innovation.

However, R&D intensity — the headline indicator for the strategy's smart growth priority — is expected to remain below the 3 % objective that the EU has set for itself for 2020. In 2015, R&D expenditure as share of GDP was at 2.03 % and had shown only limited progress over time, despite increases in public and private R&D expenditure since 2007. Estimates show that to meet the 2020 target, EU R&D intensity would need to grow three times as fast as it did between 2007 and 2014 — 6.7 % versus 1.9 % annually ([50]) ([51]). According to these projections, if the 2007 to 2014 trend continues, investment in R&D is forecasted to rise to only 2.28 % by 2020 ([52]). The more recent stagnation in R&D expenditure in 2014 and 2015 means that the likelihood of reaching the target is even lower than described in the projection. Progressing more rapidly towards the 3 % target would require a faster structural shift to more knowledge-based economic activities.

R&D intensity could reach 2.6 % if Member States meet their national targets. However, progress towards these has been uneven. In 2015, Denmark had already met its national targets, while Slovakia, Cyprus and Germany came very close, with a gap of 0.02, 0.04 and 0.13 percentage points, respectively, to be closed by 2020. However, most Member States still need to significantly accelerate their R&D intensity growth to be able to meet their respective national targets ([53]). In terms of building up the necessary human capital, it has been estimated that the EU will need to train and employ at least one million new researchers compared with 2008 levels if it is to reach its 3 % R&D target ([54]).

Although factors influencing R&D investment tend to be very context-specific, the European Semester Country Reports, published by the European Commission as part of the Europe 2020 policy cycle, identify some persistent challenges in the European research and innovation system that impede progress towards the Europe 2020 priorities. According to the European Semester Thematic Factsheet — Research and Innovation 2016 ([55]), these bottlenecks could be grouped in three main categories: low quality of the public research and innovation system in some Member States, mainly a result of their lower public R&D investment; weak knowledge flows and science-business linkages; and insufficiently attractive framework conditions for R&D investment and entrepreneurial activity.

A number of EU policy actions and instruments have been put in place to address these challenges. The European Commission's 'Open Innovation, Open Science, Open to the World' ([56]) initiative brings together some of the most recent of these and places emphasis on making science and innovation more open, collaborative and global. The Commission has established three pillars of action for its Open Innovation Policy, namely reforming the regulatory environment, boosting private investment and maximising impacts. Some specific actions under the first pillar include: the establishment of the Scientific Advice Mechanism for providing the Commission policy-making activities with independent scientific advice; the 'Innovation Deals', which make it possible for innovators to question EU rules posing obstacles to innovation; the

([50]) The authors note that one should bear in mind that the growth rate in R&D intensity over the 2007–2014 period was boosted by a depressed GDP.
([51]) European Commission, *Science, Research and Innovation Performance of the EU*, Brussels 2016 (p. 30).
([52]) Ibid.
([53]) Id., p. 36.
([54]) European Commission, *Researchers' report — Final report 2014, Brussels*, 2014 (p. 54).
([55]) European Commission, *European Semester Thematic Factsheet — Research and Innovation 2016* (pp. 1–8).
([56]) European Commission, *Open Innovation, Open Science, Open to the World*, Brussels, 2016.

Horizon 2020 Policy Support Facility, which provides Member States Horizon 2020 associated countries with practical support in the design, implementation and evaluation of research and innovation policy reforms. Under the second pillar the Commission has planned some of the following policy measures: setting up a European Venture Capital Fund of Funds, which would support businesses as they start up and grow, and maximising the use of the European Fund for Strategic Investments for mobilising private funding for strategic investments and for risk finance for small businesses. Under the third pillar, the Commission foresees further implementation of the Seal of Excellence, which identifies promising Horizon 2020 project proposals and recommends them for further funding from alternative sources; establishment of a European Innovation Council, which would help converting knowledge and science into market-creating products and services and a second wave of Horizon 2020 simplification ([57]).

European initiatives in the area of Open Science include the establishment of Open Science Policy Platform, the creation of European Open Science Cloud, the advancement of open access and data policies, the removal of legal barriers to the use of text and data mining techniques for research and innovation and the fostering of research integrity, to name a few examples ([58]).

The European Commission has also put to use all available instruments to maximise the impact of international co-operation on research and innovation, for example Horizon 2020, the Strategic Forum for International Science, policy dialogues on science and technology co-operation with key international partners and external policies ([59]).

([57]) European Commission, *Open Innovation, Open Science, Open to the World*, Brussels, 2016 (p. 17–30).
([58]) Id., p. 33–55.
([59]) Id., p. 64–79.

3 Climate change and energy

3.1 Climate change and energy — why do they matter?

By changing weather patterns, redrawing coastlines and degrading natural ecosystems, unchecked climate change threatens to erode the foundations on which modern society is built. To avoid dangerous levels of warming, the international community, including the EU, committed to the objective of limiting the mean global temperature rise to well below 2 °C above pre-industrial levels and to drive efforts to limit the increase even further to 1.5°C. This agreement ([1]) was signed at the UNFCCC 21st Conference of the Parties (COP 21) in 2015 in Paris. A target of 2 °C was already agreed upon in 2009 at COP 15 in Copenhagen ([2]). As a means of implementing the international obligations in the EU, the Europe 2020 strategy aims to turn the EU into a so-called 'low-carbon' economy based on renewable energy sources and energy efficiency.

To contribute to this global goal, the EU has pledged to continually reduce the amount of greenhouse gases (GHGs) it emits. The Europe 2020 strategy reinforced this commitment, aiming to turn the EU into a so-called 'low-carbon' economy and reduce GHG emissions by 80–90 % by 2050 compared with 1990. Among all GHGs, emissions of carbon dioxide (CO_2) are the most prevalent, accounting for about 81 % of the EU's GHG emissions in 2014 (without land use, land use change and forestry (LULUCF) ([5]). Other GHGs include nitrous oxide, methane and fluorinated gases. The aggregate of GHGs is often measured in CO_2 equivalents to make the data comparable. In addition to mitigating climate change, climate and energy policies have further environmental and health benefits, by helping to reduce air pollution and the health risks it poses. This lowers health costs and increases well-being, particularly in cities.

The transition towards a low-carbon economy is not only a strategy to prevent catastrophic climate change. Climate and energy policies contribute to the core objective of the Europe 2020 strategy ([6])

Europe 2020 strategy targets on climate change and energy

The Europe 2020 strategy sets three objectives for climate and energy policy, to be reached by 2020 ([3]):

- **Reducing GHG emissions by at least 20 % compared with 1990 levels;**
- **Increasing the share of renewable energy in gross final energy consumption to 20 %; and**
- **Moving towards a 20 % increase in energy efficiency.**

These targets are also known as the '20-20-20' targets. The Europe 2020 strategy's three climate and energy targets are interrelated and mutually support one another. The EU is currently debating the climate and energy targets for 2030 (see Box 3.2, page 88). With the Clean Energy for All Europeans ([4]) legislative package of November 2016, the European Commission has tabled a comprehensive set of legislative proposals and measures to further develop climate and energy policy after 2020.

([1]) United Nations Framework Convention on Climate Change, *Paris Agreement*, Paris, United Nations, 2015.
([2]) United Nations Framework Convention on Climate Change, *Copenhagen Accord*, Copenhagen, United Nations, 2009.
([3]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, Brussels, 2014.
([4]) European Commission, *Clean energy for all Europeans*, COM(2016) 860 final.
([5]) EEA, *Annual European Union greenhouse gas inventory 1990–2014 and inventory report 2016*, Technical report No 15/2016, Copenhagen 2016.
([6]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels, 2010.

Climate change and energy in the EU

Greenhouse gas emissions

Index 1990 = 100

fell from **90.6** in 2008 to **77.9** in 2015

2020 target: 80

see page 85

... by sector

fuel combustion in energy industries, million tonnes of CO_2 equivalent

2010	2015
1 445	1 242

see page 89

... in non-ETS sectors

% change since 2005

2008	2015
– 4.4	– 13.5

see page 90

Global CO_2 emissions

from fuel combustion, million tonnes

2010	2014
30 450	32 381

see page 91

Global temperature

temperature increase, compared with 1850–1899 average

2008	2015
0.71	1.06

see page 92

Renewable energy

Share in gross final energy consumption

rose from **8.5 %** in 2004 to **16.7 %** in 2015

2020 target: 20 %

see page 94

... by source

Gross inland consumption of renewable energy, 2015, %

Bio	Hydro	Wind	Solar	Geo-thermal
64.4	14.0	12.4	6.2	3.1

see page 96

... in electricity consumption

%

2004	2015
14.3	28.8

see page 97

... in fuel consumption of transport

%

2004	2015
1.4	6.7

see page 97

Energy consumption

Primary energy consumption

fell from **1 692 Mtoe** in 2008 to **1 530 Mtoe** in 2015

2020 target: 1 483 Mtoe

Final energy consumption

fell from **1 180 Mtoe** in 2008 to **1 082 Mtoe** in 2015

2020 target: 1 086 Mtoe

see page 99

... by sector

% in total FEC, 2015

Transport	Industry	Residential
33.2	25.3	25.3
Service	**Agriculture**	**Other**
13.6	2.2	0.4

see page 101

Energy dependence

% of imports in total energy consumption

2008	2015
54.5	54.0

see page 103

Energy imports

petroleum products, million tonnes

2008	2015
716	696

see page 104

of enabling sustainable growth. A push for renewable energy and energy efficiency — two key levers for reducing emissions — can spur innovation and create jobs. Therefore, the EU's '20-20-20' targets are also interlinked with other Europe 2020 goals, in particular those for research and development (R&D) and employment.

The EU can become a lead market in fields with high global demand. Creating demand for ever-better green products while boosting innovation and export strength in the growing global market will be key to mastering new technologies such as smart grids, energy storage and electric vehicles. At the same time, more efficient energy use will improve the competitiveness of EU businesses by lowering production costs.

Furthermore, more renewables and improved energy efficiency can reduce energy dependence and save the EU between EUR 175 and 320 billion in energy import costs per year over the next 40 years ([7]). As recognised in the flagship initiative Innovation Union, a push for technological and policy innovation will be crucial for accomplishing this transformation.

The EU's Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy ([8]), introduced in 2015, complements existing climate change and energy governance policies for the period up to 2020 and will guide the development of policies for the following decade up to 2030. It aims to ensure secure, affordable and climate-friendly energy supply by focusing on five related and mutually supportive dimensions: 1) energy supply security of the EU; 2) the EU-internal energy market; 3) energy efficiency improvements; 4) GHG emission reduction; and 5) research and innovation. To implement these goals, the European Commission presented the Clean Energy for all Europeans package ([9]) in November 2016. The package encompasses a set of legislative proposals and facilitating measures which are now being discussed in the European Council and in the European Parliament.

The analysis in this chapter is based on the three headline indicators chosen to monitor the climate and energy targets: 'GHG emissions', 'share of renewable energy in gross final energy consumption' and 'primary and final energy consumption'.

Contextual indicators are used to present a broader picture, looking into the drivers behind changes in the headline indicators. Changes in EU GHG emissions are analysed in relation to underlying sectoral trends. Based on this analysis EU trends are compared with information on the global trend in GHG emissions and its impact on global mean temperature and the climate system. The analysis then turns to the two most important measures for cutting EU emissions, namely energy supplied from renewable sources and energy efficiency. For both fields, progress at the EU and Member State levels is assessed with a special focus on the wider socioeconomic effects of the emerging green economy.

([7]) European Commission, *Climate Action: Benefits of climate action*, 2016 (accessed 1 June 201).
([8]) European Commission, *A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*, COM(2015) 80 final, Brussels, 2015.
([9]) European Commission, *Clean Energy for all Europeans*, COM(2016) 860 final, Brussels, 2016.

3.2 The EU is on track to achieving its GHG emission reduction target for 2020

In 2015, EU greenhouse gas emissions, including emissions from international aviation and indirect CO_2 emissions, were down by 22.1 % compared with 1990 levels. The EU is thus expected to exceed its Europe 2020 target of reducing GHG emissions by 20 % by 2020.

All sectors, except fuel combustion in transport and international aviation, contributed to the reductions between 1990 and 2015. In 2015 transport emissions have risen for the second consecutive year — coinciding with a return of stronger economic growth.

Reducing **greenhouse gas emissions** is a central objective of the Europe 2020 strategy. As a result, the EU as a whole aims to reduce these emissions by 20 % compared with 1990 levels (including international aviation and indirect CO_2 emissions). The main policy instruments to achieve this target are the EU Emissions Trading System (EU ETS) ([10]) and the Effort Sharing Decision (ESD) ([11]).

The EU ETS sets a single EU-wide cap for more than 11 000 power stations and industrial plants, as well as the emissions from flights within the European Economic Area (EEA). It allows these economic actors to trade emission allowances among themselves. The cap shrinks each year to reach an emissions reduction of 21 % compared with 2005 by 2020.

The Effort Sharing Decision sets binding annual GHG emissions targets for Member States for sectors not included in the EU ETS. Member States' targets for the non-EU ETS sectors (such as transport, buildings, agriculture and waste) vary between a 20 % reduction to a 20 % increase in emissions by 2020, reflecting differences in starting points and wealth ([12]). Less wealthy economies are allowed to increase their emissions to accommodate higher economic growth.

Their targets still limit emissions compared with business-as-usual scenarios; hence all Member States are committed to making reductions. By 2020, the national targets will collectively deliver a reduction of around 10 % in total EU emissions from the non-EU ETS sectors compared with 2005 levels.

Together, the EU ETS and the Effort Sharing Decision will reduce overall emissions to around 14 % below 2005 levels by 2020 ([13]). This will equal a 20 % cut below 1990 levels. In addition to these overarching instruments, the EU has set an array of policy tools to address emissions from certain sectors and activities. Box 3.1 lists the most important tools.

By 2015, the EU as a whole had cut man-made GHG emissions by 22.1 % compared with their 1990 levels (see Figure 3.1). A large portion of this reduction occurred during the 1990s. Between 1990 and 1994 a large drop of 6.8 % occurred, mostly due to structural changes (such as a shift from heavy manufacturing industries to more service-based economies), modernisation in industries and a change from coal to gas. Emissions began to rise again in 1995, but this trend reversed in 1997. Between 1998 and 2007

([10]) See: http://ec.europa.eu/clima/policies/ets/index_en.htm
([11]) 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.
([12]) See http://ec.europa.eu/eurostat/documents/4411192/4411431/Europe_2020_Targets.pdf
([13]) Based on Eurostat data on greenhouse gas emissions, base year 1990 (accessed 6 July 2016).

Box 3.1: Key policy instruments to reduce GHG emissions

The EU has adopted a number of instruments to complement the EU Emissions Trading System (EU ETS) and the Effort Sharing Decision (ESD). The most relevant, given the energy sector's importance as a major source of emissions, are those underlying the renewable energy and energy efficiency targets.

The Renewable Energy Directive ([14]) (RED) sets a framework for promoting energy from renewable sources. It establishes mandatory national targets, detailed planning and regular monitoring requirements, and rules on simplifying administrative procedures. Within this framework, Member States have leeway to develop their own support schemes for renewable technologies.

The Energy Efficiency Directive ([15]) (EED) creates an overarching framework for improving efficiency in Member States to ensure the EU's energy efficiency target is met. It is complemented by sector-specific instruments such as the Energy Performance of Buildings Directive ([16]), which sets insulation standards for newly built buildings, the Ecodesign Directive ([17]) defining performance standards for energy-using products and the Energy Taxation Directive ([18]), which sets minimum rates for energy products.

To increase energy efficiency in the transport sector, the EU has set mandatory emissions reduction targets for new passenger cars ([19]). Fleets must emit no more than an average of 95 grams of CO_2 per kilometre by 2020. Similarly, the Vans Regulation ([20]) limits CO_2 emissions from new vans to a fleet average of 147 grams of CO_2 per kilometre by 2020.

emissions stabilised at around 92–94 % of 1990 levels. This was mainly the result of a decrease in the consumption of fossil fuels. However, significant cuts were also made in the waste sector through the reduction of landfilling and in agriculture due to a decline in livestock numbers and nitrogenous fertiliser use ([21]).

By far the sharpest single-year decline in GHG emissions since the early 1990s occurred between 2008 and 2009 (– 7.2 %). During this time the economic crisis reduced industrial production, transport volumes and energy demand. The following years only saw slow recovery in many parts of Europe. The decline of CO_2 emissions observed between 2009 and 2012 can mainly be attributed to three factors: improvement in the energy intensity of the EU economy, development of renewable energy sources and the economic slowdown ([22]).

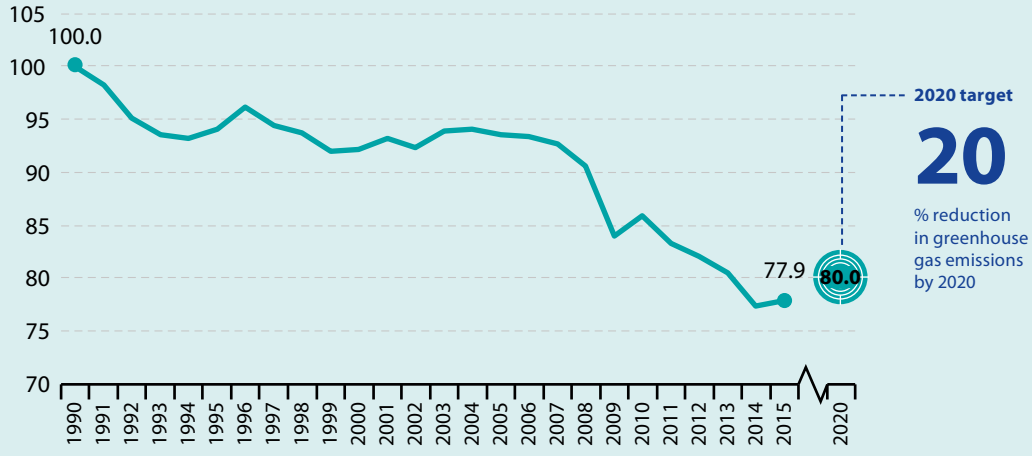
From 2013 to 2014, GHG emissions fell by 3.1 %, while GDP grew 1.7 % ([23]). The largest share of emission reductions during this year were achieved in the energy sector, with more than 80 % of cuts occurring because of lower

([14]) Directive 2009/28/EC of the European Parliament and the European Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
([15]) European Commission, 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. European Commission, Brussels, 2012, Art. 3.
([16]) Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
([17]) Directive 2009/125 of 21 October 2009 establishing a framework for the setting of eco design requirements for energy-related products.
([18]) Directive 2003/96 of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity.
([19]) Regulation 443/2009 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.
([20]) 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.
([21]) *Climate change — driving forces*, Statistics Explained, Eurostat Website (retrieved June 2017).
([22]) EEA, *Analysis of key trends and drivers in greenhouse gas emissions in the EU between 1990 and 2015*, EEA Report No. 8/2017, Copenhagen 2016.
([23]) Based on Eurostat data on real GDP growth rate — volume (accessed 12 June 2017).

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

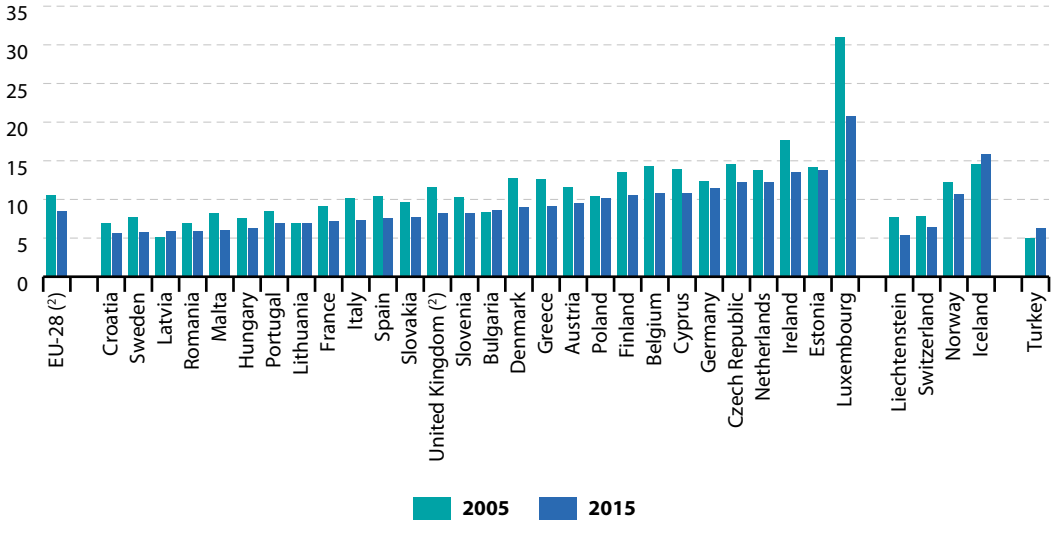
Figure 3.1: Greenhouse gas emissions, EU-28, 1990–2015 (1)
(Index 1990 = 100)



(1) Total emissions, including international aviation and indirect CO_2, but excluding emissions from land use, land use change, and forestry (LULUCF).

Source: European Environment Agency, Eurostat (online data code: t2020_30)

Figure 3.2: Greenhouse gas emissions per capita, by country, 2005 and 2015 (1)
(Tonnes of CO_2 equivalent)

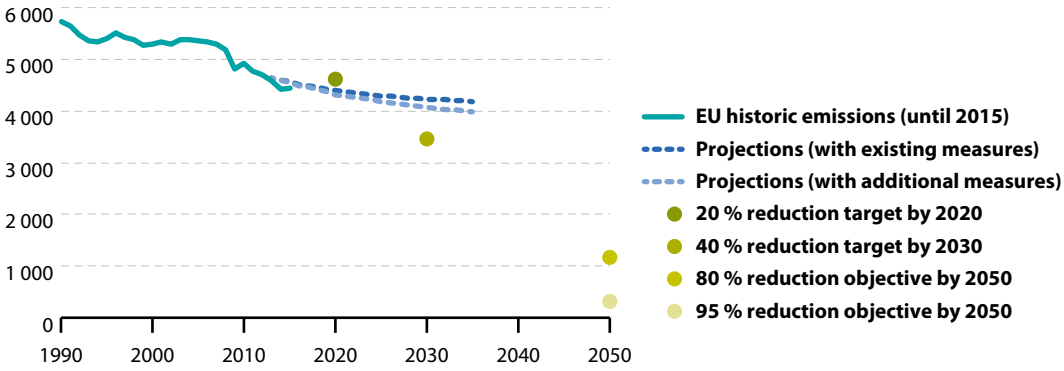


(1) Total emissions, including international aviation and indirect CO_2, but excluding emissions from land use, land use change, and forestry (LULUCF).

(2) 2014 data (instead of 2015).

Source: European Environment Agency, Eurostat (online data code: t2020_rd300)

Figure 3.3: Greenhouse gas emissions and projections, 1990–2050 ([1])
(Million tonnes of CO_2 equivalent)



([1]) Total EU GHG emissions include those from international aviation; exclude those from land use, land-use change and forestry (LULUCF).
Source: European Environment Agency

Box 3.2: The 2030 climate and energy framework

The 2030 climate and energy framework was adopted by EU leaders in October 2014 and builds on the 2020 climate and energy package. The strategy sets three key targets for the year 2030:

- At least a 40 % reduction in greenhouse gas emissions (from 1990 levels);
- At least a 27 % share for renewable energy;
- At least a 27 % improvement in energy efficiency (increased to a target of at least 30 % improvement in the Commission's proposal for a recast energy efficiency directive).

The 2030 framework is also in line with the long-term perspective of the Roadmap for moving to a competitive low carbon economy in 2050 ([24]), which sets out the pathway towards the EU's objective of reducing emissions by 80–95 % by 2050 compared with 1990 levels ([25]).

In the European Council Conclusions of October 2014 ([26]), the European Council stressed that the indicative target at the EU level set for improving energy efficiency by at least 27 % will be reviewed by 2020, having in mind an EU level of 30 %. In the Clean Energy for All Europeans ([27]) legislative package of November 2016, the European Commission proposed a binding EU energy efficiency target of 30 % by 2030.

([24]) European Commission, *A Roadmap for moving to a competitive low carbon economy in 2050*, Brussels, 2011.
([25]) European Commission, *Europe 2020 — A strategy for smart, sustainable and inclusive growth*, COM(2010) 2020 final, Brussels, 2010.
([26]) European Council (23 and 24 October 2014) — Conclusions, EUCO 169/14.
([27]) European Commission, *Clean energy for all Europeans*, COM(2016) 860 final.

emissions from electricity generation in thermal power stations ([28]). However, between 2014 and 2015, GHG emissions started to rise again, by 0.5 %, and real GDP continued to grow, by 2.2 % ([29]). This increase in emissions was the result of growth in road transport, both passenger and freight. Furthermore, colder temperatures in Europe in 2015 led to rising emissions in the residential and commercial sectors ([30]).

Dividing emission figures by the total population provides a way of comparing countries' GHG emissions on a more equal footing. Figure 3.2 shows Member States' overall per capita GHG emissions for the years 2005 and 2015. Luxembourg emitted the most GHG per capita in the EU in 2015. This can partly be attributed to a considerable number of commuters from neighbouring countries fuelling their cars on Luxembourgish territory, as well as road freight transit and fuel tourism ([31]). Luxembourg was followed by Estonia, Ireland and the Netherlands. In contrast, per capita emissions were lowest in some eastern and southern European countries as well as in Sweden.

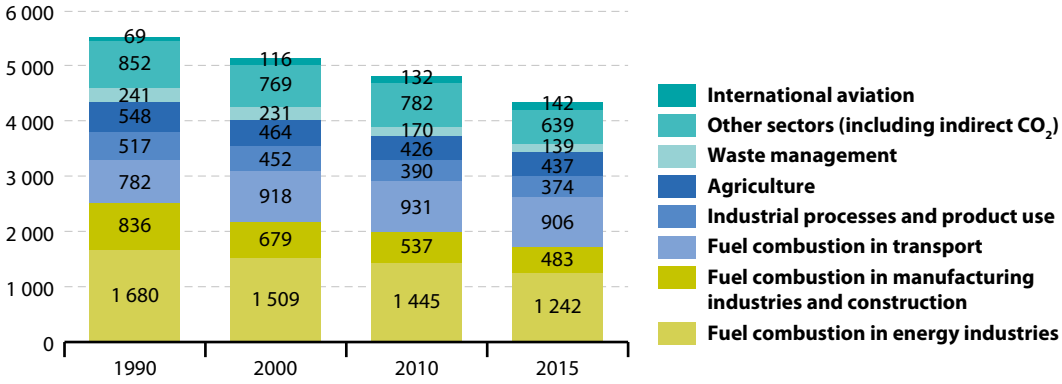
Between 2005 and 2015, Luxembourg showed the highest reduction in per capita emissions. Ireland, Denmark, Greece, Belgium, Finland and Cyprus also showed large falls. However, emissions rose in some of the eastern Member States over the same time frame.

Looking towards 2020, projected GHG emissions based on Member States' existing policy measures shows the EU is on track to surpass its 2020 target (see Figure 3.3). However, it can also be seen that existing and already planned measures are not enough to put the EU on track to meet its target for the next decade to reduce GHG emissions by 40 % by 2030 ([32]). Thus, further efforts will be needed. This is why the EU is introducing new mitigation policies for the period after 2020, with in particular a reform of the EU ETS and the Effort Sharing Regulation. These proposals should be adopted by the end of 2017.

3.2.1 All sectors except transport have lowered emissions since 1990

Figure 3.4 shows how each sector has contributed to the EU's total GHG emissions. All sectors, except fuel combustion in transport and international aviation, contributed to the overall GHG emission reductions from 1990 to 2015.

Figure 3.4: Greenhouse gas emissions by sector, EU-28, 1990, 2000, 2005 and 2015
(Million tonnes of CO_2 equivalent)



Source: European Environment Agency, Eurostat (online data code: tsdcc210)

([28]) EEA, *Annual European Union greenhouse gas inventory 1990–2014 and inventory report 2016*, EEA Report No 15/2016, Copenhagen 2016.
([29]) Based on Eurostat data on real GDP growth rate — volume (accessed 12 June 2017).
([30]) EEA, *Annual European Union greenhouse gas inventory 1990–2015 and inventory report 2017*, EEA Report No 6/2017, Copenhagen 2017.
([31]) Eurostat, *Using official statistics to calculate greenhouse gas emissions*, Luxembourg 2010 (p. 28).
([32]) European Council (23 and 23 October 2014) — Conclusions , Brussels 2014.

In absolute terms, energy industries made the biggest emission reductions with 438 million tonnes of CO_2 equivalent over the period (26.1 %). Nevertheless, it is still the sector responsible for the largest share of total emissions (27.9 % in 2015). The second largest reduction of 353 million tonnes of CO_2 equivalent was achieved in the manufacturing industries and construction (42.2 %).

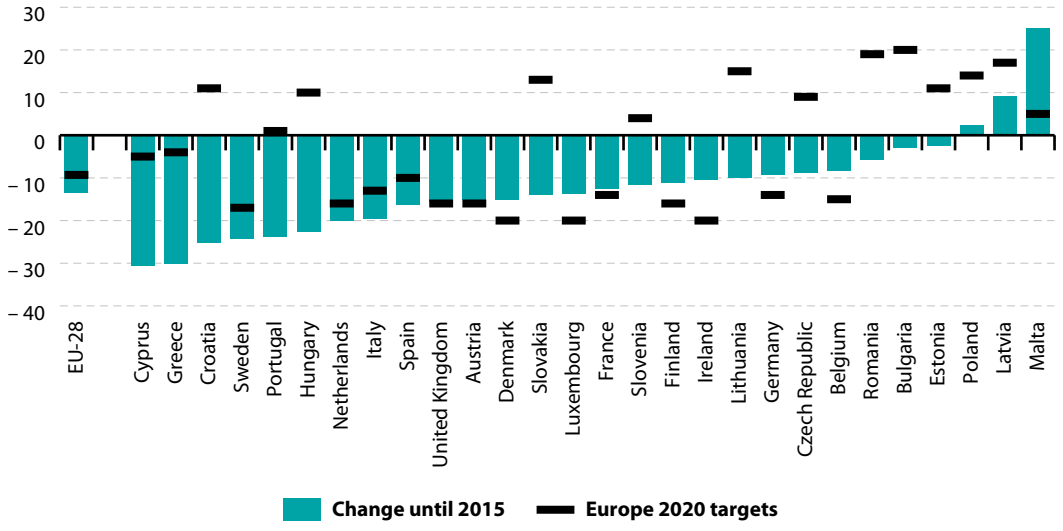
By contrast, transport emissions were 15.9 % higher in 2015 than in 1990. Fuel combustion in transport accounted for 20.4 % of total EU emissions in 2015, making it the second largest source after the energy industries. However, transport emissions were even higher in 2007, where they peaked at 988 million tonnes of CO_2 equivalent and then fell by 10.6 % by 2013, reaching their lowest point in 16 years. Ex-post evaluation of climate policies showed that the recent emission reductions in the transport sector were explained by the increasing share of biofuels as well as increased car efficiency ([33]). However, in 2015 transport emissions rose for the second consecutive year and are now 2.5 % above 2013 levels — coinciding with a return of stronger economic growth. Improving energy efficiency and increasing the share of alternative fuels therefore remain crucial to permanently reducing the transport sector's GHG emissions.

Emissions from international aviation more than doubled between 1990 and 2015, increasing from 69 to 142 million tonnes of CO_2 equivalent.

3.2.2 Continuous positive developments in non-ETS emissions since 2005

Figure 3.5 shows Member States' non-ETS emissions between 2005 and 2015, as well as their 2020 non-ETS targets. Sixteen countries reduced their emissions and have already reached their national targets. Emissions increased in three countries, but of these only Malta overshot its target. Ten Member States remain above their national reduction targets, although all of them except one had reduced their emissions up to 2015. Malta was the furthest from its target, followed by Ireland, Belgium and Luxembourg.

Figure 3.5: Greenhouse gas emissions in non-ETS sectors, by country, 2015 ([1])
(% change since ESD base year)



([1]) Total emissions, excluding emissions covered by the Emissions Trading Scheme (ETS).
Source: European Environment Agency, Eurostat (online data code: t2020_35)

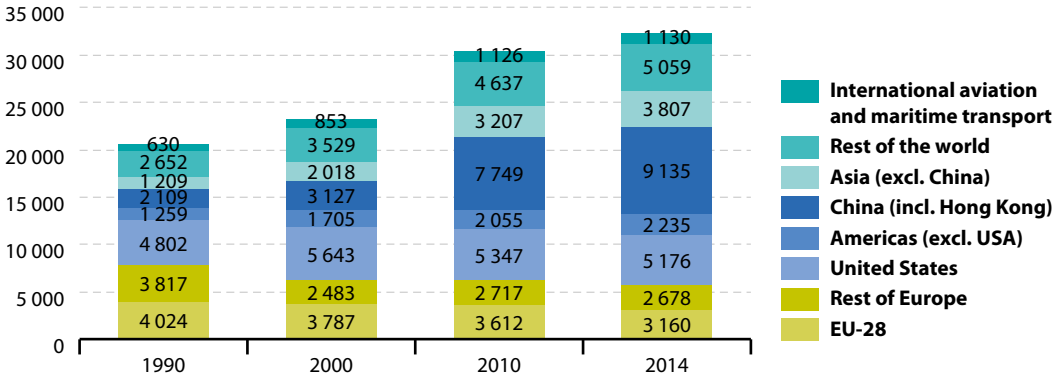
([33]) EEA, *Why did GHG emissions decrease in the EU between 1990 and 2012?*, 2014.

The overall positive trend for non-ETS emissions in the EU can be linked mainly to the building sector as a result of energy efficiency improvements and a less carbon-intensive fuel mix for space heating ([34]). However, mild winter temperatures are also partly responsible for the fall in energy demand. The reductions in transport emissions since 2007 also contributed to the decrease.

3.2.3 Global CO_2 emissions and mean temperature continue to rise

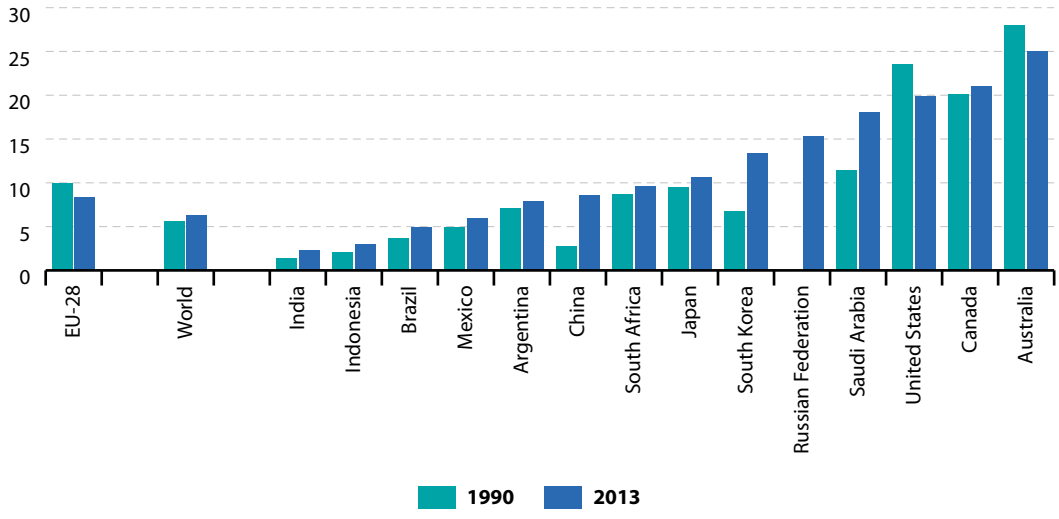
Despite reductions in the EU, global CO_2 emissions from fuel combustion rose by 57.9 % between 1990 and 2014, as shown in Figure 3.6. Most of the increase took place in emerging economies. Emissions growth, both in relative and absolute

Figure 3.6: Global CO_2 emissions from fuel combustion, 1990, 2000, 2010 and 2014
(Million tonnes of CO_2 equivalent)



Source: International Energy Agency (IEA)

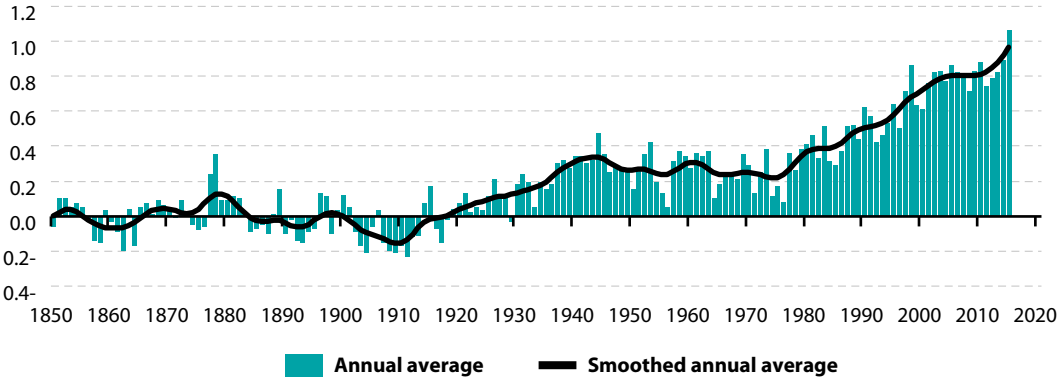
Figure 3.7: Total greenhouse gas emissions per capita, by country, 1990 and 2013
(tonnes of CO_2 equivalent per capita)



Source: World Resources Institute (CAIT database)

([34]) EEA, *Annual European Union greenhouse gas inventory 1990–2015 and inventory report 2017*, Technical report No 19/2015, Copenhagen 2017.

Figure 3.8: Global annual mean temperature deviations, 1850–2015
(Temperature deviation in °C, compared with 1850–1899 average)



Source: Climatic Research Unit, University of East Anglia and the UK Met Office Hadley Centre

terms, was strongest in China. Between 1990 and 2014, China's annual CO_2 emissions more than tripled and the country overtook the United States to become the world's biggest emitter. At the same time, China's per capita emissions from fuel combustion reached 6.66 tonnes of CO_2, outpacing the EU level of 6.22 tonnes ([35]).

Although less important in absolute terms, emissions in the rest of Asia and the rest of the world also grew significantly in relative terms between 1990 and 2014 (214.8 % and 90.8 % respectively). As a result of these trends, the EU's share of global CO_2 emissions has been shrinking, from almost a fifth in 1990 to 9.8 % in 2014.

In 2013, GHG emissions per capita remain at very different levels across the globe (see Figure 3.7). On average, an Australian emits 11 times as much as an Indian citizen. Even within the group of industrialised countries, emission levels per person vary widely. The US level is, for example, more than twice as high as the EU average. However, between 1990 and 2013 a trend towards greater convergence can be observed. While per-capita emissions have decreased in the EU (– 15 %), the US (– 15 %) and Australia (– 11 %), emission levels per person have increased in poorer countries, with the biggest rises taking place in China (+ 211 %) and South Korea (+ 98 %). Over the same time frame, the global average per-capita emissions increased by 11.2 %, reaching 6.3 tonnes of CO_2-equivalent in 2013.

Rising emissions have dramatically increased CO_2 levels in the atmosphere. Although there is a time lag between CO_2 being emitted and the corresponding increase in average global surface temperature, recordings already show a clear upward trend (see Figure 3.8). Between 2001 and 2010, the global surface temperature was around 0.89 °C higher than during the first decade of the 20th century. The year 2015 was the warmest year since records began in 1850. Current projections estimate that global mean temperatures could rise by as much as 2.6 °C to 4.8 °C compared with the reference period (1986–2005) by the late 21st century (2081–2100) if CO_2 emissions remain at current levels ([36]).

Despite the EU's shrinking share of global CO_2 emissions, recent findings on the potentially catastrophic impacts of climate change confirm the ongoing importance of its climate and energy goals. EU emission cuts alone cannot halt climate change, but the GHG reduction objectives for 2030 and 2050 are considered a fair contribution to the global mitigation efforts, consistent with the internationally agreed objective ([37]) of keeping the temperature increase below 2 °C compared to

([35]) IEA, *CO_2 Emissions from Fuel Combustion*, 2016.
([36]) EEA, *SOER 2015 — The European environment: Increasingly severe consequences of climate change (GMT 9)*, 2015.
([37]) United Nations Framework Convention on Climate Change, *Paris Agreement*, Paris, United Nations, 2015.

pre-industrial levels ([38]). Moreover, if the EU can show that a low-carbon economy is feasible, and can even increase innovation and employment, it will serve as a role model to other regions. Continuous investment in advanced low-carbon technologies can also help the EU uphold technological leadership and secure export markets. A successful clean energy transition, discussed in the next section, will create the condition for sustainable jobs, growth and investment.

Box 3.3: The consequences of climate change

In Europe and globally, temperature rises have already led to observable changes in natural systems and society. For example, the warming of lakes and rivers has led to more frequent algal blooms and forced species to move northwards ([39]). Damage costs from natural disasters have increased and are likely to rise substantially in the future ([40]).

A European Environment Agency (EEA) assessment shows that climate change will not affect European regions equally. For example, it is likely to increase existing vulnerabilities such as exposure to flood risk in coastal areas or drought in the Mediterranean region. Coastal erosion and flooding due to sea-level rise, as well as more extreme weather events such as storms and heat waves, are the biggest threats to people and infrastructure. In southern Europe, problems of water availability and more frequent droughts threaten to lower crop productivity even with a temperature rise of 1–2 °C, putting the region's agricultural sector at risk ([41]).

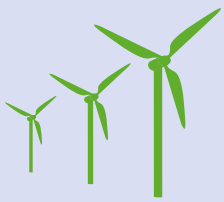
By hitting marginalised regions and poor people the hardest, climate change could deepen socioeconomic imbalances in Europe.

3.3 More renewable energy means fewer GHG emissions

Renewable energy is on the rise in the EU: in 2015 it provided 16.7 % of gross final energy consumption, up from 8.5 % in 2004. Member States' renewable energy shares ranged from 53.9 % in Sweden to 5.0 % in Luxembourg and Malta. Electricity from solar or wind projects is increasingly competitive with fossil fuel-based power generation.

Solid, liquid and gaseous biofuels still provide the biggest share of total renewable energy in the EU. It is the largest renewable energy source used in transport and for heating and cooling.

For transport, renewable energy provided 6.7 % of all energy used in 2015, up from 1.4 % in 2004.



In the electricity sector, hydropower remains the dominant renewable energy technology. However, thanks to cost reductions and effective support schemes, the share of wind and solar energy has increased particularly quickly.

([38]) European Commission, *Impact Assessment accompanying the Communication A policy framework for climate and energy in the period from 2020 up to 2030*, SWD(2014)15.
([39]) EEA, *Climate change, impacts and vulnerability in Europe 2016*, EEA Report No 1/2017, Copenhagen 2017.
([40]) EEA, *Economic losses from climate related extremes* (accessed on 7 July 2017).
([41]) See footnote 39.

3.3.1 Renewable energy keeps growing steadily

The Europe 2020 strategy's second climate change and energy target is to increase the **share of renewable energy in gross final energy consumption** to 20 % by 2020. Gross final energy consumption comprises the energy supplied to the final consumers for all energy uses and the consumption of electricity and heat by the energy branch for electricity and heat production, including losses of electricity and heat in distribution and transmission.

Between 2004 and 2015, the share of renewable energy almost doubled, reaching 16.7 % of gross final energy consumption in 2015 (see Figure 3.9). The two main drivers of this increase were the implementation of support schemes for renewable energy technology and falling costs of renewable energy systems ([42]). (However, it must also be kept in mind that updated and more accurate statistical information, as a result of revisions based on specialised surveys, have also contributed to this increase, in particular data revisions in the area of solid biomass (wood) consumption in households). Over the past decade, there has been a steady growth in installed capacity for renewable electricity and heat generation, driven by policies such as feed-in tariffs, grants, tax credits and, more recently, tenders. At the same time, an introduction of obligatory quotas has stimulated the use of renewable transport fuels ([43]). In the electricity sector, an upscaling of global production volumes as well as technological advances have allowed producers to substantially cut energy costs. New photovoltaic power stations built in 2016 produce electricity for a third of the costs required in 2009 and are approaching the cost level of onshore wind. The offshore wind industry has also achieved dramatic cost cuts, roughly halving costs per kilowatt-hour between 2011 and 2016 ([44]). Electricity from wind turbines and large solar installations is becoming increasingly competitive with new fossil fuel plants.

These price falls led some Member States to restrict support for new renewable energy projects, which reduced profitability and created uncertainty for investors ([45]). In combination with lower costs per unit, this lowered total investment

Box 3.4: Implementing the EU 2020 renewable energy target in the Member States

The EU's renewable energy target has been broken down into national targets that reflect differences in resource base and wealth.

To ensure the renewable energy targets are met, the Renewable Energy Directive adopted in 2009 ([46]) allows Member States to put in place support schemes and requires them to remove administrative barriers to the authorisation, certification and licensing of renewable energy plants.

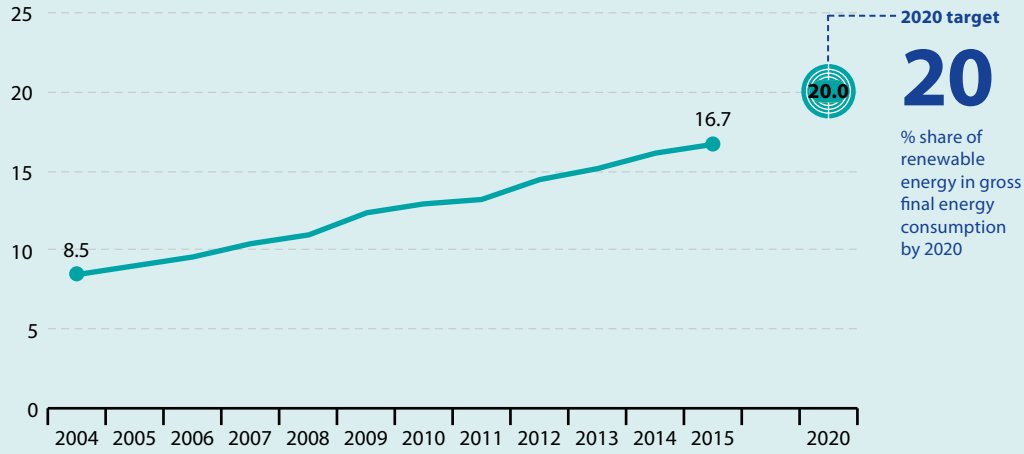
All Member States created national renewable energy action plans (NREAPs) in 2010. These outline how they plan to achieve their target and include interim targets and trajectories per sector and technology. Progress on these plans is reported to the European Commission every two years. In addition, Member States report on their national renewable energy policies in the National Reform Programme under the Europe 2020 strategy.

([42]) EEA, *Renewable energy in Europe 2017: recent growth and knock-on effects*, EEA Report No 3/2017, Copenhagen 2017.
([43]) Ecofys, *Renewable energy progress and biofuels sustainability*, Utrecht 2014.
([44]) McCrone, Angus et al, *Global Trends in Renewable Energy Investment 2017*, Frankfurt School of Finance and Management, commissioned by UN Environment's Economy Division in co-operation with Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and produced in collaboration with Bloomberg New Energy Finance, Frankfurt am Main 2017.
([45]) See footnote 42.
([46]) Directive 2009/28/EC of the European Parliament and the European Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, 2009.

EUROPE 2020 HEADLINE INDICATOR

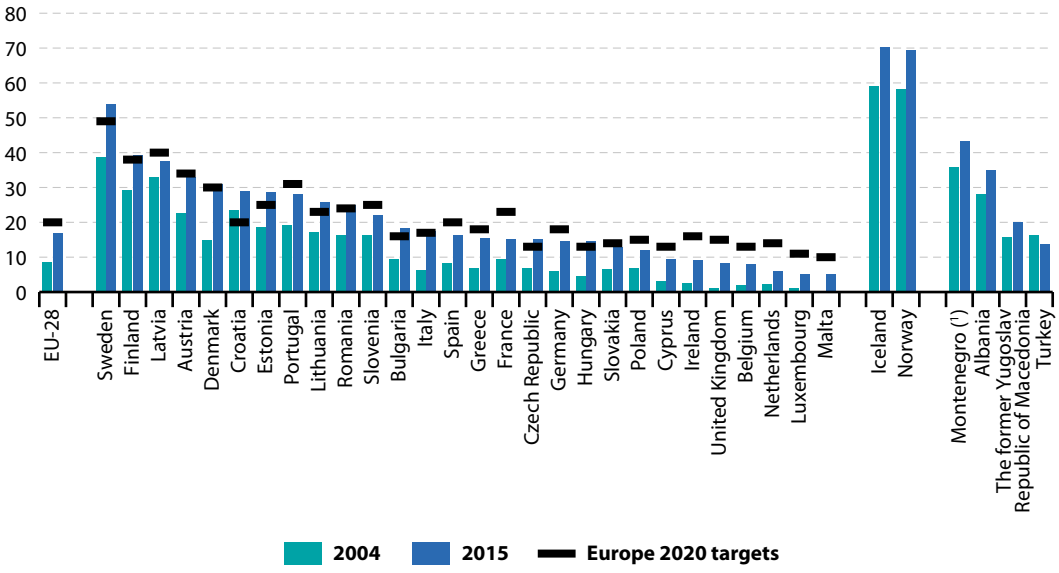
Europe 2020 headline indicator

Figure 3.9: Share of renewable energy in gross final energy consumption, EU-28, 2004–2015
(%)



Source: Eurostat (online data code: t2020_31)

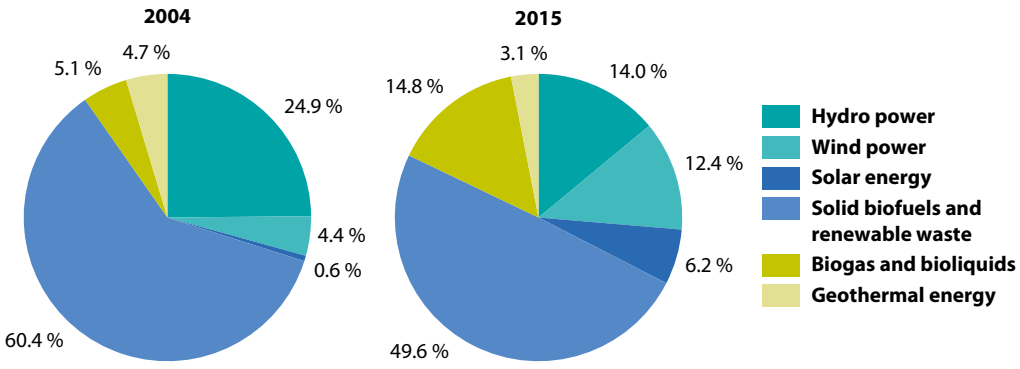
Figure 3.10: Share of renewable energy in gross final energy consumption, by country, 2004 and 2015
(%)



(1) 2005 data (instead of 2004).

Source: Eurostat (online data code: t2020_31)

Figure 3.11: Gross inland consumption of renewable energy, by source, EU-28, 2004 and 2015 (%)



Source: Eurostat (online data code: nrg_107a)

in renewable energy plants. Renewable energy investment in Europe (including the Commonwealth of Independent States) peaked at EUR 88.9 billion in 2011, when both Italy and Germany experienced a boom in photovoltaic installations, and declined by over 40 % in the following four years. In 2016, the decline was halted and investment rebounded by 3 % compared to 2015, reaching EUR 55.2 billion ([47]).

In 2015, the share of renewable energy in gross final energy consumption in Member States ranged from 53.9 % in Sweden to 5.0 % in Luxembourg and Malta (see Figure 3.10). Differences between Member States stem from variations in natural resources, such as the potential for building hydropower plants and the availability of biomass, but also from the success of national climate and energy policies. All EU countries increased their renewable energy share between 2004 and 2015. Fourteen have more than doubled their share, albeit from a low base. Ten have already met their 2020 targets.

Compared with other world regions, the EU's renewable energy share is relatively high. The continent of Africa, where the use of traditional biomass is still widely used, procured almost half of its total primary energy supply from renewable sources in 2014, however, most emerging and industrialised countries have lower shares. For example, China covered 11.4 % of its primary energy supply through renewable sources in 2014 ([48]), followed by Mexico with 8.5 %, the United States (7.1 %), Australia (6.6 %) and Japan (5.3 %). In the Middle East, the share was as low as 0.4 %. An exception was Canada, which had a renewable share of 18.0 % in 2014 due to its abundant hydropower resources ([49]).

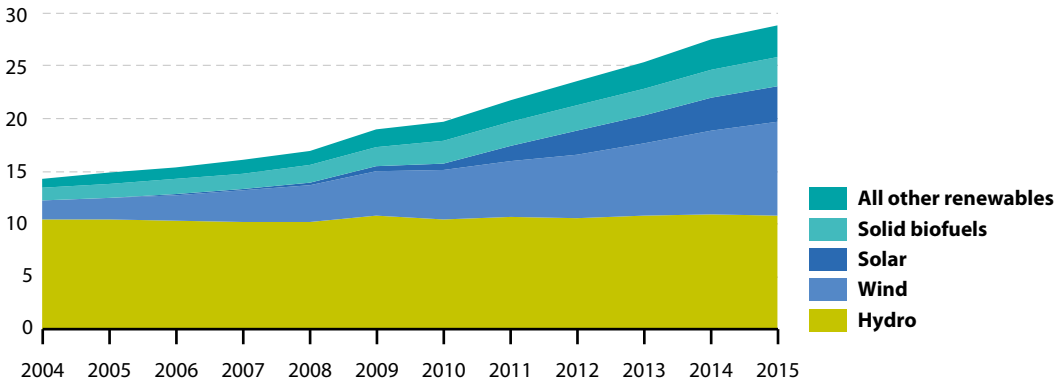
3.3.2 Biofuels dominate renewable energy but wind and solar are expanding fast

Renewable energy can be generated from a range of sources, including hydro, wind, solar and geothermal power. Bioenergy remains by far the EU's most important renewable energy source because it contributes to all energy use sectors (electricity generation, transport and heating and

([47]) McCrone, Angus et al, *Global Trends in Renewable Energy Investment 2017*, Frankfurt School of Finance and Management, commissioned by UN Environment's Economy Division in co-operation with Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and produced in collaboration with Bloomberg New Energy Finance, Frankfurt am Main 2017, p. 14. US dollar values were converted to euros based on Eurostat exchange rate data (online data code: ert_bil_eur_a).
([48]) Note that the headline indicator for consumption of renewables in the EU is calculated as a share of gross final energy (16.7 % in 2015), while the shares shown here for non-EU countries are expressed as a percentage of primary energy supply. The figures are thus not directly comparable to the shares shown in Figure 3.9 and 3.10.
([49]) *IEA Headline Global Energy Data*, 2016 edition.

Figure 3.12: Share of renewable energy sources in total final electricity consumption, EU-28, 2004–2015 (1)

(%)



(1) According to the requirement set in Annex II of Directive 2009/28/EC, hydro and wind generation is normalised to smooth out variability in weather over a 15-year period for hydro and a five-year period for wind. Pumping is excluded because it is a storage technology not an energy source. Solar includes solar photovoltaics and solar thermal generation. All other renewables includes electricity generation from gaseous and liquid biofuels, renewable municipal waste, geothermal, and tide, wave and ocean.

Source: Eurostat (SHARES 2015)

cooling). In 2015, solid biofuels, renewable waste, biogas and liquid biofuels provided 64.4 % of the total gross inland consumption of renewable energy (see Figure 3.11). At the same time, wind and solar energy are growing the fastest. In 2015, the EU generated 26.0 million tonnes of oil equivalent (Mtoe) from wind energy — a more than five-fold increase compared with 2004. In the same year, solar energy contributed 13.1 Mtoe, more than 18 times as much as in 2004.

3.3.3 Shares of renewable energy in different sectors

Renewable energies contribute both to electricity and energy consumption for heating and cooling as well as to the transport sector.

After rapid expansion over the past decade, renewables contributed 28.8 % of total gross final electricity consumption in 2015, compared with 14.3 % in 2004 (50). Hydropower remained the largest source, but declined in relative weight as wind, solar and biogas experienced rapid growth (see Figure 3.12).

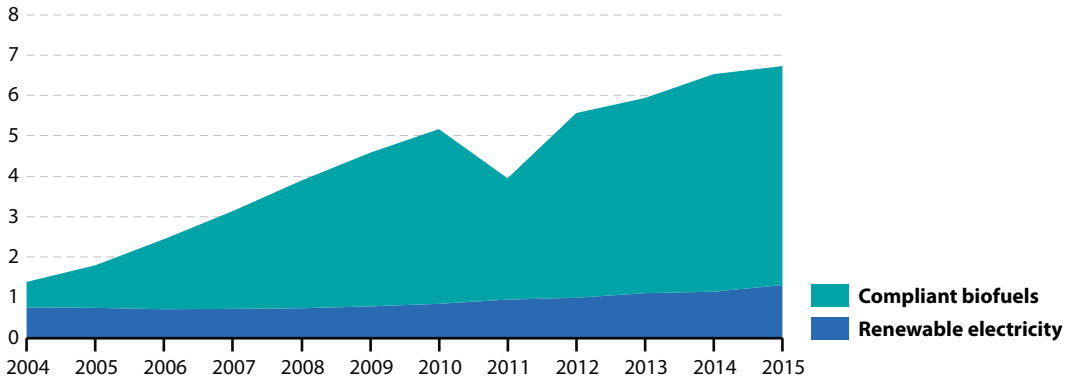
Moreover, renewable energy provided 18.6 % of Europe's final energy consumption for heating and cooling in 2015, up from 10.2 % in 2004 (51). Solid biofuels delivered the largest share of total renewable consumption, followed by minor contributions from biogas, solar thermal and ambient heat captured by heat pumps.

Between 2011 and 2015, the share of renewables in transport energy use increased from 4.0 % to 6.7 %. Figure 3.13 shows this share has increased almost continuously since 2004, with a break in 2011 when the accounting methodology changed.

The Renewable Energy Directive (52) (Directive 2009/28/EC) sets sustainability criteria for the production of liquid biofuels, which make up the largest share of renewables in transport (53). Since 2011, only those biofuels certified as sustainable according to the Directive are counted towards

(50) Eurostat, *Shares 2015 — Short assessment of renewable energy sources* (last update: 27 March 2017).
(51) Ibid.
(52) Directive 2009/28/EC of the European Parliament and the European Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, 2009.
(53) See footnote 50.

Figure 3.13: Share of renewable energy in fuel consumption of transport, EU-28, 2004–2015 ([1])
(%)



([1]) Break in series in 2011; since 2011 only sustainable biofuels that comply with Directive 2009/28/EC have been included in the data. The data presented above are calculated using multipliers for renewable electricity used in the transport sector and advanced biofuels.

Source: Eurostat (SHARES 2015)

the share of renewables in transport and are therefore included in the indicator. Some Member States transposed the sustainability standards into national law earlier than others. This change in the accounting methodology explains the drop in the share of renewables in transport from 2010 to 2011.

Consumption of liquid biofuels in transport has been growing steadily, but also slowly. In 2015, the overall share of renewable energy in transport was at 6.7 % in the EU. In the same year, Member States' shares ranged between 0.4 % and 24 %. However, despite a slight increase in the EU's overall share of renewable energy in transport of 0.2 % between 2014 and 2015, the share fell or remained stable in 12 Member States.

A 2015 amendment to the Fuel Quality Directive and the Renewable Energy Directive ([54]) puts greater emphasis on production of advanced biofuels (biofuels stemming from the residual non-food parts of crops, as well as crops that are not used for food purposes). Furthermore, it limits the contribution of liquid biofuels produced from crops grown on agricultural land towards the 2020 renewable energy transport target to 7 %. Alternative biofuels, mainly based on used cooking oil, contributed 23 % to all compliant biofuels used in the EU in 2015, up from 1 % in 2009 ([55]).

([54]) Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
([55]) European Commission, *Renewable energy progress report*, (COM(2017) 57 final), Brussels, 2017.

3.4 The EU needs to further pursue energy efficiency improvements

The EU has made substantial progress towards its energy efficiency objective. The 2020 target for final energy consumption has already been achieved. With respect to primary energy consumption, the EU must achieve a further reduction of 3.1 % over the five years between 2015 to 2020 to achieve the target of improving energy efficiency by 20 %. In 2015, the EU consumed 10.7 % less primary energy than in 2005.

Although energy efficiency policies have helped drive reductions in primary energy consumption, some of the reductions can be attributed to lower economic output and warmer than average years, such as 2013 and 2014.

All but two Member States reduced primary energy consumption compared to 2005 by values ranging from 3.3 % to 27.3 %.

Between 2005 and 2015, agriculture and forestry, as well as industry, have reduced final energy consumption by over a quarter, while consumption in the residential sector has remained stable. By contrast, energy consumption in the services and transport sectors has risen by 35.2 % and 26.3 %, respectively.

The EU still relies heavily on energy imports from non-EU countries, which provided 54.1 % of all energy consumed in 2015. The main supplier of energy to the EU in 2015 was Russia. It supplied 37.3 % of total gas imports, 32.9 % of imports of petroleum products and 29.1 % of solid fuel imports.

Delivering the same service or product by using less energy is one of the most cost-effective ways of reducing GHG emissions and enhancing energy security. Building renovations as well as efficiency improvements in the transport sector offer the biggest potential for further reductions ([56]).

The target is to move towards a 20 % increase in energy efficiency. In absolute terms this means that by 2020 EU energy consumption should not exceed 1 483 Mtoe of primary energy or 1 086 Mtoe of final energy ([57])([58]).

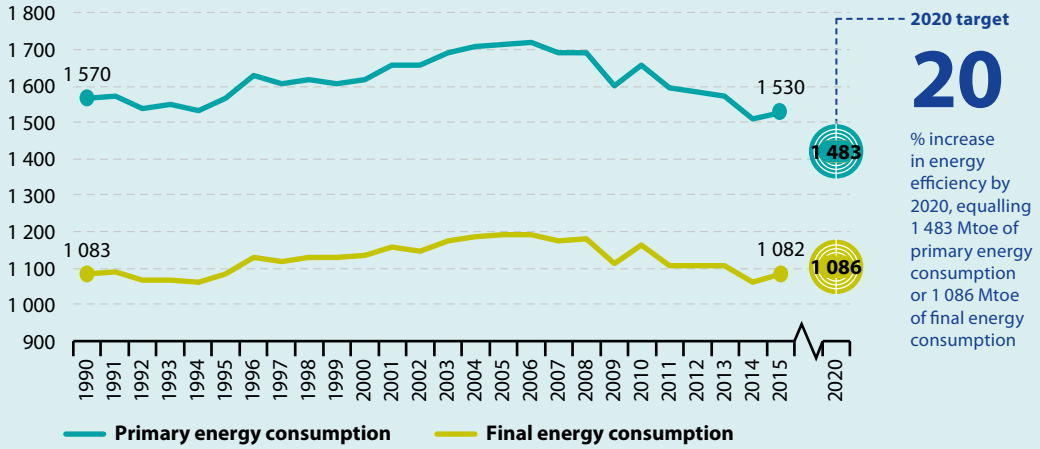
Primary energy consumption (PEC) includes all gross inland energy consumption except energy carriers employed for non-energy purposes, for example, petroleum or gas not used for combustion but for producing plastics. By contrast, final energy consumption only comprises the energy supplied to the final consumer's door for all energy uses, excluding energy used by the energy sector. The difference between primary and final energy consumption is equivalent to the energy losses occurring during energy transformation (particularly electricity generation), transmission and distribution.

([56]) European Commission, 2016 assessment of the progress made by Member States in 2014 towards the national energy efficiency targets for 2020 and towards the implementation of the Energy Efficiency Directive 2012/27/EU as required by Article 24 (3) of the Energy Efficiency Directive 2012/27/EU, (COM (2017) 56 final), Brussels, 2017.
([57]) European Commission, Directive 2012/27/EU of the European Parliament and 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.
([58]) Council Directive 2013/12/EU of 13 May 2013 adapting Directive 2012/27/EU of the European Parliament and of the Council on Energy Efficiency, by reason of the accession of the Republic of Croatia.

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

Figure 3.14: Primary energy consumption and final energy consumption, EU-28, 1990–2015
(Million tonnes of oil equivalent)



Source: Eurostat (online data codes: t2020_33 and t2020_34)

3.4.1 Energy consumption in the EU has been decreasing, with a reversed trend in recent years

As shown in Figure 3.14, PEC in the EU was on an intermittent but overall rising trend until 2006 when it peaked at 1 722 Mtoe. However, by 2009, following the economic crisis, it had fallen sharply by 124 Mtoe. It rebounded temporarily in 2010, but continued on its downward path over the next four years, reaching 1 508 Mtoe in 2014. The downward trend was interrupted in 2015, when PEC increased by 1.4 % compared to the previous year. In 2015, the EU consumed 2.5 % less primary energy than it did in 1990 and 10.7 % less than in 2005. To achieve the target for 2020, the EU needs to reduce its primary energy consumption by another 3.1 % in the five years between 2015 and 2020.

Much of the decrease between 2008 and 2009 may be attributed to reduced economic activity as a result of the financial and economic crisis, rather than to a structural shift in energy consumption patterns. In 2010, an especially cold winter caused a sharp increase in heating demand. The most recent reductions from 2011 onwards can again be partly attributed to reduced economic output expressed by a 0.5 % contraction of real GDP in 2012. However, primary energy consumption continued to fall thereafter, despite a real GDP growth of 1.7 % in 2014 ([59]). Warmer years in 2013 and 2014, and improvements in energy efficiency due to new policies, are considered to have contributed to this decrease ([60]). The slight increase in 2015 reflects a return to more average heating demand compared to the exceptionally warm 2014 ([61]).

([59]) Based on Eurostat data on real GDP growth rate — volume (accessed 7 July 2017).
([60]) EEA, *Trends and Projections in Europe 2016 — Tracking progress towards Europe's climate and energy targets*, European Environment Agency, Copenhagen, 2016.
([61]) European Commission, *Report from the Commission to the European Parliament and the Council: 2016 assessment of the progress made by Member States in 2014 towards the national energy efficiency targets for 2020 and towards the implementation of the Energy Efficiency Directive 2012/27/EU as required by Article 24 (3) of the Energy Efficiency Directive 2012/27/EU*, COM(2017) 56 final, Brussels 2017.

The analysis underlines the need to further pursue energy-efficiency measures. Continuous effort can ensure PEC will continue to decrease even when economic growth accelerates.

The trend in final energy consumption has closely followed the trend in primary energy consumption, reaching 1 082 Mtoe in 2015. This means that the energy efficiency target for final energy consumption has already been reached.

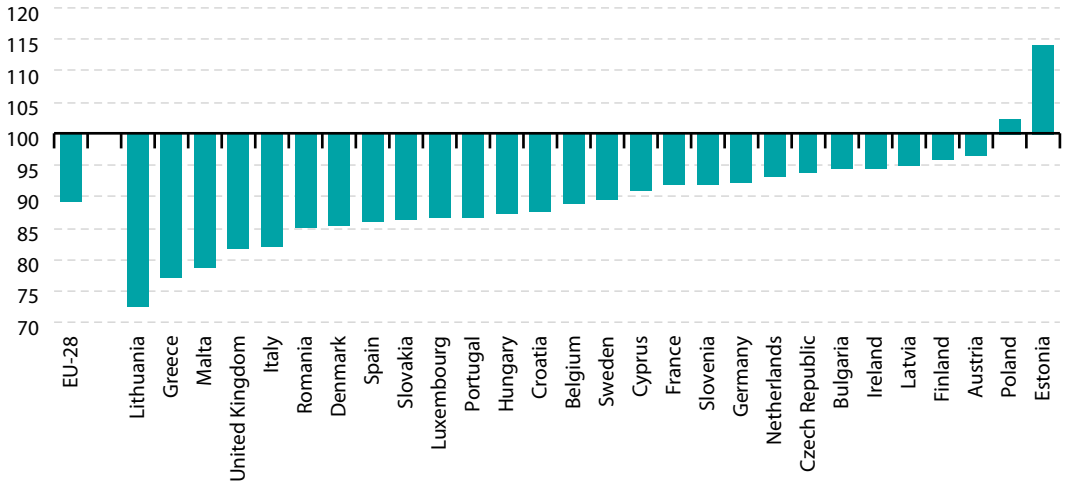
According to the Energy Efficiency Directive (EED) ([62]), the EU efficiency target is measured as a 20 % saving compared with a hypothetical projection for EU primary energy consumption (PEC). Starting with the 2005 base year, this business-as-usual projection (carried out in 2007) estimated a primary energy consumption of 1 853 Mtoe in 2020. It assumed continuous economic growth and no additional energy-efficiency policies above and beyond those in place in 2005. The envisaged 20 % saving amounts to an absolute saving of 370 Mtoe, resulting in a target PEC value of no more than 1 483 Mtoe for 2020 ([63]). Compared with the actual PEC in 2005, this is equivalent to a reduction of 13.4 %.

Globally, only one major economy has reduced PEC by more than the EU: Japan consumed 16 % less primary energy in 2015 than it did in 2005. The United States reduced its PEC by 5.9 % over the same time frame, whereas energy demand rose in all other big industrialised countries and regions. The highest increase of 68 % between 2005 and 2014 was observed in China, followed by the Middle East (53.9 %), South Korea (31.3 %) ([64]) and Africa (28.8 %) ([65]). An increase in PEC can, however, occur despite energy efficiency improvements. In emerging economies in particular, high economic growth and population drive up demand for energy.

3.4.2 Changes in energy consumption at Member State and sector level

Figure 3.15 shows the change in PEC from 2005 to 2015 in all Member States. Looking at the 2015 data, 26 Member States reduced primary energy

Figure 3.15: Change in primary energy consumption, by country, 2015
(Index 2005 = 100)



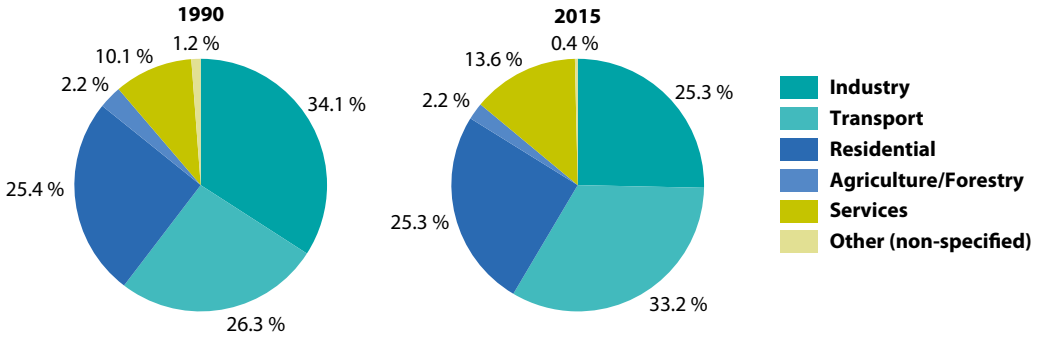
Source: Eurostat (online data code: t2020_33)

([62]) European Commission, Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125 and 2010/30 and repealing Directives 2004/8 and 2006/32, European Commission, Brussels, 2012, Art. 3.
([63]) Council Directive 2013/12/EU adapting Directive 2012/27/EU of the European Parliament and of the Council on energy efficiency, by reason of the accession of the Republic of Croatia (accessed 20 April 2016).
([64]) Refers to provisional 2015 data.
([65]) International Energy Agency, Statistics, *Headline Energy Data*, 2016 edition.

Box 3.5: National energy efficiency targets

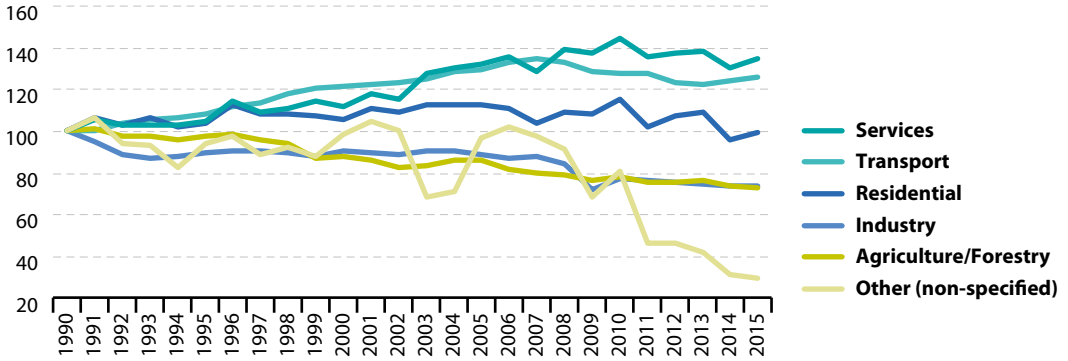
The revised Energy Efficiency Directive (EED) adopted in 2012 ([66]) requires Member States to set indicative national energy efficiency targets for 2020. These can be based on different indicators (primary or final energy consumption, or primary or final energy savings, or energy intensity). To make these targets comparable, the Directive also requires each Member State to 'translate' its target into levels of primary and final energy consumption in 2020. In addition, Member States need to explain how this has been calculated. Taken collectively, the national indicative targets result in a 3 % higher PEC than the absolute 2020 target set at EU level, which means Member States overall are not aiming for sufficient energy use reductions ([67]).

Figure 3.16: Final energy consumption, by sector, EU-28, 1990 and 2015
(% in total FEC)



Source: Eurostat (online data code: tsdpc320)

Figure 3.17: Final energy consumption, by sector, EU-28, 1990–2015
(Index 1990=100)



Source: Eurostat (online data code: tsdpc320)

([66]) Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125 and 2010/30 and repealing Directives 2004/8 and 2006/32, Brussels, 2012, Art. 3.
([67]) EEA, *Trends and Projections in Europe 2016 — Tracking progress towards Europe's climate and energy targets*, Copenhagen, 2016.

consumption compared to 2005 by values ranging from 3.3 % to 27.3 %. PEC increased in Poland and Estonia by 2.7 % and 14.3 %, respectively (see also Box 3.5 on national targets).

Between 1990 and 2015, economic sectors showed different final energy consumption trends (see Figure 3.16 and Figure 3.17). Agriculture and forestry, as well as industry, reduced their final energy consumption by 26.6 % and 25.8 %, respectively, while the residential sector's consumption remained stable with a reduction of just 0.3 %. By contrast, energy consumption in the services and transport sectors grew by 35.2 % and 26.3 % respectively over the same time period.

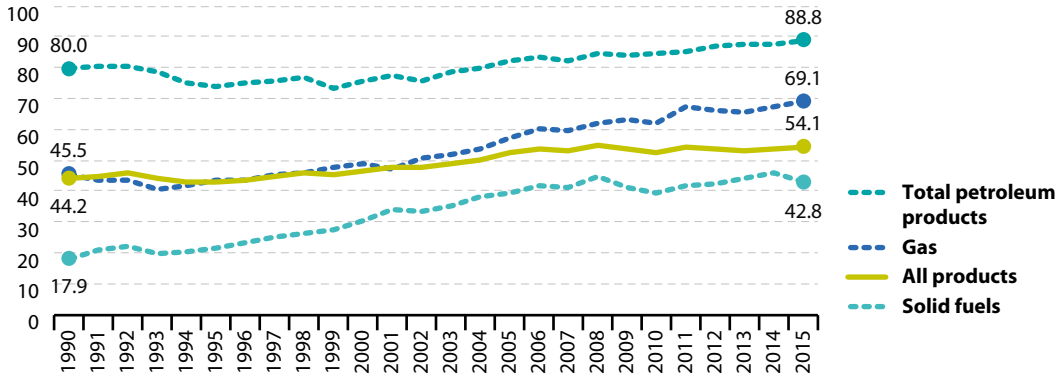
While these changes reflect sector-specific levels of energy-efficiency improvement, they also relate to structural changes in the EU economy, particularly a shift away from an energy-intensive industry to a service-based economy. In the case of transport, a large share of efficiency gains have been outweighed by rising volumes of transport over the past few decades. In 2015, the majority of final energy was used in transport with a 33.2 % share, followed by industry and the residential sector with shares of 25.3 % each. The services sector was responsible for 13.6 % and agriculture and forestry for 2.2 % of final energy consumption.

Despite recent reductions in energy consumption, substantial potential for cost-efficient improvements in energy efficiency remains untapped. There is, for example, particular scope for savings in transport, building refurbishment, industrial processes and along the energy supply chain.

3.4.3 EU's dependency on energy imports has been increasing, despite renewable energy and energy efficiency improvements

Energy-efficiency improvements can strengthen the EU's competitiveness and lower its dependence on fossil fuel imports. The EU's energy dependence — the share of total energy needs met by imports from non-EU countries — has increased significantly over the past decade, reaching 54.1 % in 2015 (see Figure 3.18). Shrinking domestic production of fossil fuels is mostly responsible for this increase. By contrast, most renewable energy can be sourced domestically. The imported share of solid fuels such as hard coal has more than doubled between 1990 and 2015, while the share of imports in total gas consumption has increased by 25 percentage points. The increasing demand for fossil fuel imports is driven by a decline in domestic oil,

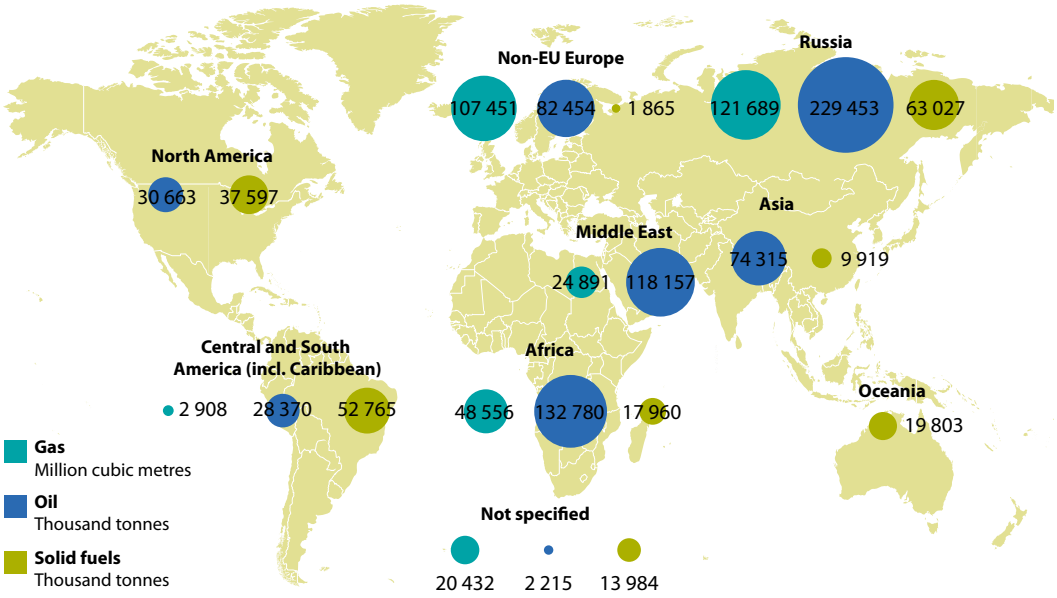
Figure 3.18: Energy dependence, EU-28, 1990–2015 ([1])
(% of imports in total energy consumption)



([1]) 'All products' is not the average of the other three fuel categories shown. It also includes other energy sources, such as renewable energy or nuclear energy, which are treated as domestic sources.

Source: Eurostat (online data code: tsdcc310)

Figure 3.19: Where the EU imports its energy carriers from, 2015
(thousand tonnes and million cubic metres)



Source: Eurostat (online data codes: nrg_122a, nrg_123a and nrg_124a)

gas and coal production ([68]). Over the observed period, the fall in EU mining and drilling has overcompensated the increase in domestic renewable energy production.

Dependence on imported energy exposes the European economy to significant costs and the risk of supply shortages, for example, due to geopolitical conflicts. The expansion of renewable energy sources and the improvement of energy efficiency reduce these risks and contribute to the Europe 2020 strategy's employment objective (see the chapter on Employment, page 25) by creating jobs and value added within EU borders.

Figure 3.19 shows where the EU imports energy from. The main supplier in 2015 was Russia. It supplied 37.3 % of gas, 32.9 % of petroleum products and 29.1 % of solid fuels imports from non-EU suppliers. The second largest source of natural gas is other non-EU European countries, mainly Norway, with 33.0 %. Also 11.8 % of oil imports come from this region. The second largest source supplying oil to the EU after Russia is Africa, with 19 %, followed by the Middle East with 16.9 %. Regarding solid fuels, Central and South America is the second largest source after Russia with 24.3 %, followed by North America with 17.3 %.

([68]) European Commission, *In-depth study of European Energy Security*, Commission Staff Working Document accompanying the European energy security strategy, SWD(2014) 330 final/3, Brussels 2014.

3.5 Outlook towards 2020

According to the 2016 Climate action progress report ([69]), the EU is expected to exceed its 2020 GHG emission target. Also at the Member State level, regarding their achievement of individual non-ETS targets (manifested in the Effort-Sharing Decision), 24 countries are on track to meet their GHG targets (except Austria, Belgium, Ireland and Luxembourg) ([70]). However, projections show that further efforts will be necessary to put the EU on track to meeting the 2030 target.

With respect to renewable energy, the EU is currently on track to meet its 2020 target ([71]). However, the European Commission's 2017 Renewable energy progress report ([72]) emphasises that continuous effort is required to keep up investment and to further remove administrative barriers. The EEA also emphasises that in view of the EU's decarbonisation objectives for 2050, the built up of renewable energy capacity needs to speed up ([73]).

The 2020 target for energy efficiency is within reach. To achieve it, the EU needs to reduce PEC by an extra 3.1 % in the five years between 2015 and 2020. Nevertheless, continuous efforts are needed to ensure primary energy consumption returns to a downward path after a slight rebound in 2015 and remains on it while the economy continues to grow. The 2016 Energy efficiency progress report ([74]) concludes there is still potential for further energy efficiency improvements, particularly in the buildings and transport sectors.

([69]) European Commission, *Implementing the Paris Agreement — Progress of the EU towards the at least 40% target*, SWD(2015) 349 final.
([70]) EEA, *Trends and Projections in Europe 2016 — Tracking progress towards Europe's climate and energy targets*, European Environment Agency, Copenhagen, 2016.
([71]) Ibid.
([72]) European Commission, *Renewable energy progress report*, COM (2017) 57 final, Brussels, 2015.
([73]) See footnote 69.
([74]) European Commission, *2016 assessment of the progress made by Member States in 2014 towards the national energy efficiency targets for 2020 and towards the implementation of the Energy Efficiency Directive 2012/27/EU as required by Article 24 (3) of the Energy Efficiency Directive 2012/27/EU*, (COM (2017) 56 final), Brussels, 2017.

4 Education

4.1 Education and training — why do they matter?

Education and training lie at the heart of the Europe 2020 strategy and are seen as key drivers for growth and jobs. The recent economic crisis along with an ageing population, through their impact on economies, labour markets and society, are two important challenges that are changing the context in which education systems operate ([1]). At the same time, education and training help boost productivity, innovation and competitiveness.

Upper secondary education is now considered the minimum desirable educational attainment level for EU citizens. Young people who leave education and training prematurely lack crucial skills and run the risk of facing serious, persistent problems in the labour market and experiencing poverty and social exclusion. Early leavers from education and training who do enter the labour market are more likely to be in precarious, low-paid jobs and to draw on welfare and other social programmes. They are also less likely to be 'active citizens' or engage in adult learning.

In addition, tertiary education, with its links to research and innovation, provides highly skilled human capital (see the chapter on 'R&D and innovation', page 55). A lack of these skills presents a severe obstacle to economic growth and employment in an era of rapid technological progress, intense global competition and labour market demand for ever-increasing levels of skill. The Europe 2020 strategy, through its 'smart growth' priority, aims to tackle early school leaving and to raise tertiary education levels.

The analysis in this chapter builds on the headline indicators chosen to monitor the strategy's education targets: 'early leavers from education and training' and 'tertiary educational attainment'. Contextual indicators are used to provide a broader picture and insight into drivers behind changes in the headline indicators. Some are also used to monitor progress towards additional benchmarks set under the EU's Strategic Framework for Education and Training 2020 (ET 2020) ([3]). These indicators include early childhood education, basic reading, maths and science skills and adult participation in learning. The benchmarks are listed in Box 4.1.

The analysis in this chapter starts with early school leaving and its impacts, followed by the typical educational pathway, starting with early childhood education, followed by the acquisition of basic skills and foreign languages, leading to tertiary education and adult participation in learning. It then switches to the 'outcome' side, looking at educational attainment in general and its impacts on the labour market. The chapter finally investigates the input in the form of public expenditure on education.

The EU's education targets are interlinked with the other Europe 2020 goals as higher educational attainment improves employability, which in turn reduces poverty. The tertiary education target is furthermore interrelated with the research and development (R&D) and innovation target because investment in the R&D sector is likely to raise the demand for highly skilled workers.

Europe 2020 strategy target on education

The Europe 2020 strategy sets the target of 'reducing the share of early leavers of education and training to less than 10 % and increasing the share of the population aged 30 to 34 having completed tertiary or equivalent education to at least 40 % by 2020' ([2]).

([1]) For further information on the impact of demographic ageing on the labour force, see the chapter on 'Employment', page 25.
([2]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, COM(2014) 130 final, Brussels, 2014.
([3]) Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020') (2009/C 119/02), Official Journal of the European Union.

Education in the EU

Early leavers from education and training

% of the population aged 18–24 with at most lower secondary education and not in further education or training

fell from **14.7 %** in 2008

to **10.7 %** in 2016

2020 target: 10 %

see page 111

... by country of birth

2016, %

outside EU-28: **19.4**

reporting country: **9.8**

see page 112

... by labour status

not employed but would like to work, %

2008: **30.0** — 2016: **37.0**

see page 113

Young people not in employment, education nor training, %

2008: **14.0** — 2016: **15.2**

see page 113

Early childhood education participation rate

2008: **91.6** — 2015: **94.8**

see page 115

Low achievers in maths

% of 15-year-old pupils

2016: **22.2**

see page 116

Tertiary educational attainment

% of the population aged 30–34 with completed tertiary education

rose from **31.1 %** in 2008

to **39.1 %** in 2016

2020 target: 40 %

see page 118

... by sex

2016, %

women: **43.9** — men: **34.4**

see page 119

Adult participation in learning, % of population aged 25 to 64

2008: **9.5** — 2016: **10.8**

see page 120

Employment rate of recent graduades (1)

2008: **82.0** — 2016: **78.2**

see page 124

Total public expenditure on education, % of GDP

2014: **5.22**

see page 125

(1) % of the population aged 20–34 who graduated from at least upper secondary education 1–3 years before the survey and are not in further education or training.

Box 4.1: ET 2020 — the EU's Strategic Framework for Education and Training 2020

The two Europe 2020 education targets also feature as EU benchmarks under the Strategic Framework for Education and Training 2020 (ET 2020) ([4]). ET 2020 aims to foster European co-operation in education and training, providing common strategic objectives for the EU and its Member States for the period up to 2020. ET 2020 covers the areas of adult participation in learning and mobility; quality and efficiency of education and training; equity, social cohesion and active citizenship; and creativity, innovation and entrepreneurship at all levels of education and training. To support the achievement of these objectives ET 2020 sets EU-wide benchmarks. In addition to the two Europe 2020 targets for education, there are another five benchmarks:

- At least 95 % of children between the age of four years and the age for starting compulsory primary education should participate in early childhood education.
- The share of low-achieving 15 year olds in reading, mathematics and science should be less than 15 %.
- The share of graduates (20 to 34 year olds) having left education and training in the past one to three years who are employed and not in any further education and training should be at least 82 %.
- An average of at least 15 % of adults should participate in learning.
- An EU average of at least 20 % of higher education graduates and of at least 6 % of 18 to 34 year olds with an initial vocational qualification should have spent some time studying or training abroad ([5]).

([4]) Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020') (2009/C 119/02), Official Journal of the European Union.
([5]) For further information, see: http://ec.europa.eu/programmes/erasmus-plus/

4.2 Early school leaving is still decreasing

Early leaving from education and training has been falling continuously in the EU since 2002, for both men and women. The fall from 17.0 % in 2002 to 10.7 % in 2016 represents steady progress towards the Europe 2020 target of 10 %.

15 countries have already reached their national targets for the rate of early leavers from education and training. Southern European countries made particularly strong progress between 2008 and 2016.

Across the EU, rates of early leaving from education and training are generally higher for people who study away from the country in which they were born.

Educational attainment strongly influences labour market participation. In 2016, about 58 % of 18 to 24 year old early leavers from education and training were either unemployed or inactive. Of the total population of 18 to 24 year olds, 15.2 % were neither in employment nor in any further education or training (NEET), putting them at risk of being excluded from the labour market.

Participation in early childhood education and care (ECEC) has grown more or less continuously in the EU since 2002. In 2015, 94.8 % of children between the age of four and the starting age of compulsory education participated in ECEC. This is very close to the ET 2020 benchmark of a participation rate of at least 95 %.

In 2015, about one fifth of 15 year olds showed insufficient abilities in reading, maths and science. This is a step backward compared to 2012. As a result, the EU as a whole is seriously lagging behind in all three domains when it comes to progress towards the ET 2020 benchmark of less than 15 % low achievers.

The EU defines upper secondary education as the minimum desirable educational attainment level for EU citizens. The skills and competences gained in upper secondary education are considered essential for successful labour market entry and as the foundation for adult learning. Therefore, the headline indicator '**early leavers from education and training**' measures the share of the population aged 18 to 24 with at most lower secondary education and who were not involved in further education or training during the four weeks preceding the survey. Figure 4.1 shows that the share of early leavers has fallen continuously from 17.0 % in 2002 to 10.7 % in 2016. This trend mirrors reductions in almost all Member States for both men and women.

Overall, in the EU men tend to leave education and training earlier than women. This gap, which was 3 percentage points in 2016, has narrowed by 1.5 percentage points since 2004. However, for the first time since 2010 the gap has widened compared to the previous year. The rate for women is already below the headline target, with only 9.2 % leaving early in 2016.

At the country level, gender differences in 2016 were particularly strong in Spain, Latvia, Malta and Cyprus. Bulgaria and Romania were the only Member States where men were more likely to stay longer in education and training than women.

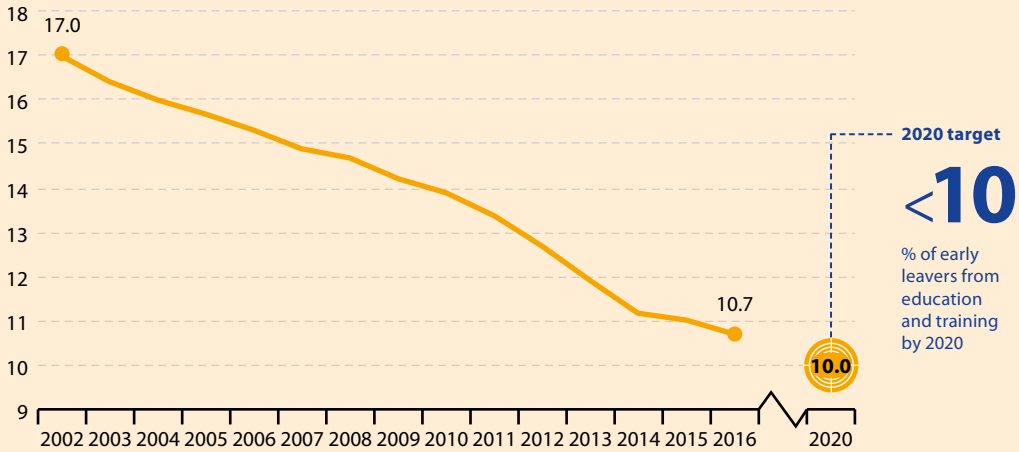
4.2.1 Substantial decreases in early leaving in southern European countries

Reflecting different national circumstances, the overall EU target for early leavers from education and training has been transposed into national targets by all Member States except the United

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

Figure 4.1: Early leavers from education and training, EU-28, 2002–2016 (1)
(% of the population aged 18–24 with at most lower secondary education and not in further education or training)



(1) Breaks in time series in 2003, 2006 and 2014.
Source: Eurostat (online data code: t2020_40)

Kingdom. National targets range from 4 % for Croatia to 16 % for Italy (see Figure 4.2). In 2016, 15 countries had already achieved their targets: Austria, Belgium, Croatia, Cyprus, Denmark, Finland, France, Greece, Ireland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands and Slovenia.

Rates of early leaving vary widely across Member States. In 2016, the lowest proportion of early leavers was observed in Luxembourg and some eastern European countries (Croatia, Lithuania, Poland and Slovenia), with rates of less than 6 %. The share was highest in Malta, Romania and Spain, with 18.5 % or more.

At the same time southern European countries experienced strong falls in early leaving between 2008 and 2016, especially Portugal (from 34.9 % to 14 %), Spain (from 31.7 % to 19 %) and Greece (from 14.4 % to 6.2 %). Overall, 17 Member States were already below the overall EU target of 10 % in 2016.

Of the candidate countries, Turkey had the highest share of early leavers, at more than three times the EU average.

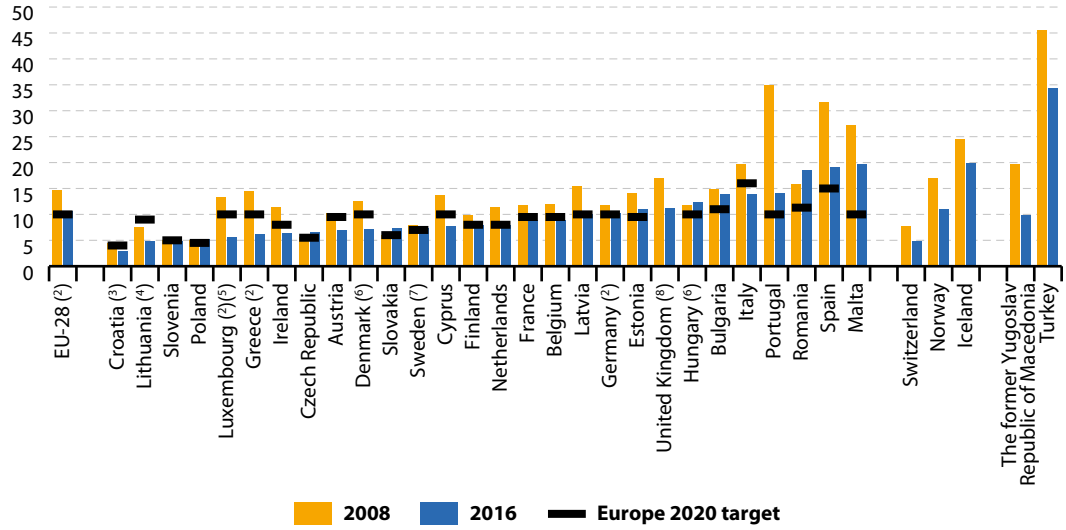
Country of birth strongly influences the rate of early leaving across the EU (see Figure 4.3). People who study away from the country in which they were born are more likely to struggle to complete their education. Socioeconomic status underlies much of this difficulty, but issues associated specifically with immigration such as language barriers and settling into a new environment are also at play, according to the Migration Policy Institute (6).

1.2.2 Early school leaving leads to severe problems in the labour market

In general, low educational attainment — at most lower secondary education — influences other socioeconomic factors. The most important of

(6) Nouwen, Ward, Noel Clycq and Daniela Ulicna, *Reducing the risk that youth with a migrant background in Europe will leave school early*, Brussels, Migration Policy Institute Europe and SIRIUS Policy Network on the education of children and youngsters with a migrant background, 2015.

Figure 4.2: Early leavers from education and training, by country, 2008 and 2016 ([1])
(% of the population aged 18–24 with at most lower secondary education and not in further education or training)



([1]) All countries: break in time series in 2014 (switch from ISCED 1997 to ISCED 2011), data are comparable for all countries except EE.
([2]) Target: less than 10 %.
([3]) 2016 data with low reliability.
([4]) Target: less than 9 %.
([5]) Break in time series in 2015.
([6]) Break in time series in 2016.
([7]) target: less than 7%.
([8]) No target in National Reform Programme.

Source: Eurostat (online data code : t2020_40)

these are employment, unemployment and the risk of poverty or social exclusion. Some of these relationships are also analysed in detail in other chapters (see the chapters on 'Employment', page 25, and 'Poverty and social exclusion', page 129).

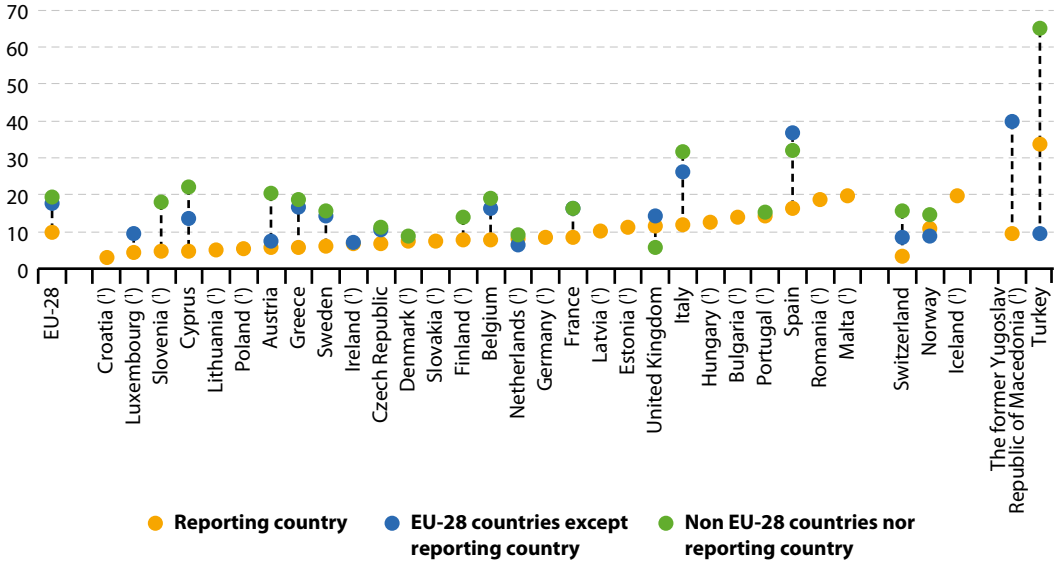
Early leavers from education and training and low-educated young people face particularly severe problems in the labour market. As shown in Figure 4.4, about 58 % of 18 to 24 year olds, with at most lower secondary education and who are not in further education or training, were either unemployed or inactive in 2016. The situation for early leavers has worsened over time: between 2008 and 2016, the share of 18 to 24 year old early leavers who were not employed but who wanted to work grew from 30 % to 37 %. For a further analysis on youth unemployment, see the chapter on 'Employment', page 25.

The indicator monitoring **young people neither in employment nor in education and training** (NEET) covers people aged 18 to 24 years. Low educational attainment is one of the key determinants of young people entering the NEET category. Other factors include having a disability or coming from a migrant background.

In 2016, 15.2 % of 18 to 24 year olds were neither in employment nor in education, exposing themselves to the risk of labour market exclusion and dependence on social security. This was an improvement since 2012 when the NEET rate peaked at 17.2 %, but was still higher than the 2008 low of 14.0 %.

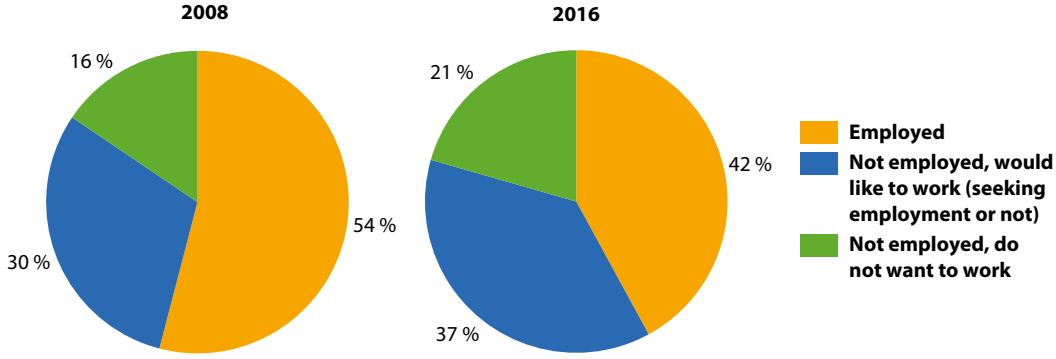
Changes in the EU NEET rate have been mainly caused by changes in the unemployment rate of 18 to 24 year olds (see Figure 4.5). In comparison, the share of inactive youths has remained stable at, or just below, 8 %. The NEET rate was slightly higher for women (15.7 %) than for men (14.7 %). However, while women in the NEET category tended to be economically inactive, men were mostly unemployed.

Figure 4.3: Early leavers from education and training by broad group of country of birth, by country, 2016
(% of the population aged 18–24 with at most lower secondary education and not in further education or training)



(1) No data for foreign countries (other EU-28 countries and/or non-EU-28 countries).
Source: Eurostat (online data code: edat_lfse_02)

Figure 4.4: Early leavers from education and training, by labour status, EU-28, 2008 and 2016 (1)
(% of the population aged 18 to 24 with at most lower secondary education and not in further education or training)



(1) Break in time series in 2014 (switch from ISCED 1997 to ISCED 2011).
Source: Eurostat (online data code: edat_lfse_14)

4.2.3 Participation in early childhood education and care has reached the ET 2020 benchmark

Early childhood education and care (ECEC) can bring wide-ranging social and economic benefits for individuals and for society as a whole. Quality ECEC provides an essential foundation for effective adult learning and future educational achievements. It also lays the foundations for later success in life in terms of well-being, employability and social integration. To realise these benefits, the EU aims to ensure that all young children can access and benefit from high-quality education and care ([7]).

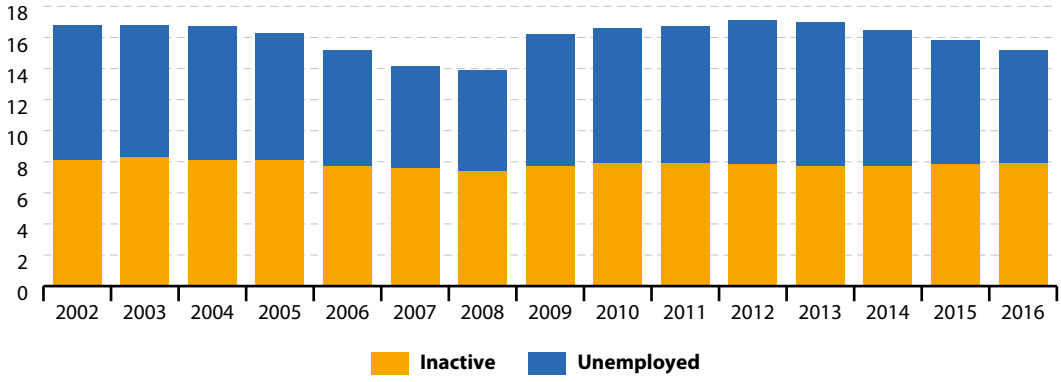
Participation in ECEC is crucial for preparing children for formal education, especially those from disadvantaged backgrounds. The aim is to reduce the incidence of early school leaving and thereby address one of the Europe 2020 headline targets on education. Investment in pre-primary education also offers higher medium- and long-term returns and is more likely to help children from low socioeconomic status than investment at later educational stages.

ET 2020 ([8]) recognises ECEC's potential for addressing social inclusion and economic challenges. It has set a benchmark to ensure that at least 95 % of children aged between four and the starting age of compulsory education participate in ECEC. As Figure 4.6 shows, participation has been rising more or less continuously in the EU since 2002, reaching 94.8 % in 2015 and therefore very close to the benchmark of 95 %. There are some variations on the country level. Half of the Member States had already exceeded the ET 2020 benchmark in 2015, implying almost universal pre-school attendance. France, Malta and the United Kingdom had already achieved a 100 % pre-school attendance, while in Belgium and Denmark participation rates were 98 % and above. At the opposite end of the spectrum, the lowest pre-school attendances were observed in Croatia (73.8 %) and Slovakia (78.4 %). When it comes to gender differences, very little variation in early childhood education can be seen across the EU.

4.2.4 Acquisition of skills such as reading, maths and science has taken a step backwards

All educational systems aim to equip people with a wide range of skills and competences. These encompass not only basic skills such as reading

Figure 4.5: Young people not in employment and not in any education and training, EU-28, 2002–2016 ([1])
(% of population aged 18 to 24)



([1]) Breaks in time series in 2003 and 2006.

Source: Eurostat (online data code: edat_lfse_20)

([7]) European Commission, *Key Data on Early Childhood Education and Care in Europe*, 2014.
([8]) Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020') (2009/C 119/02), Official Journal of the European Union.

and mathematics, but also others like science and foreign languages.

Basic skills, whether reading simple texts or performing easy calculations, provide the foundations for learning, gaining specialised skills and personal development. These skills are also essential for people to fully participate in and contribute to society. The ET 2020 framework acknowledges the increasing importance of individual skills in the era of the knowledge-based economy. Therefore, one of the targets enshrined in the ET 2020 is to reduce the share of 15 year olds achieving low proficiency levels in reading, mathematics and science to less than 15 % by 2020.

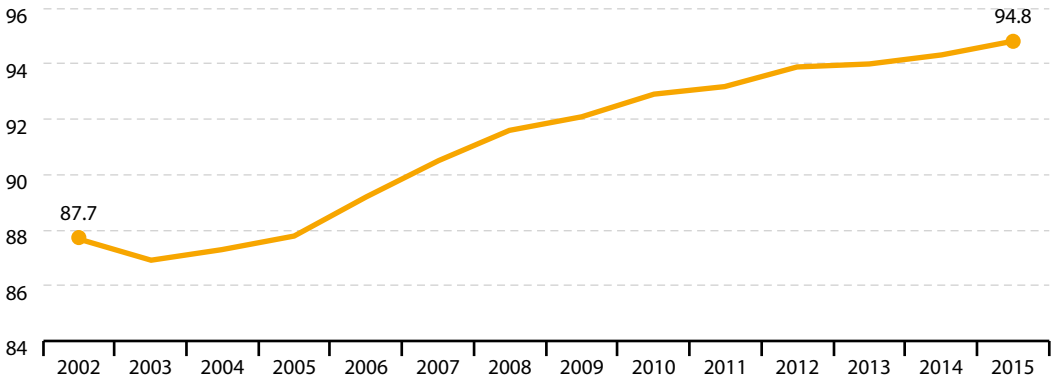
In 2015, about one fifth of 15-year-old EU citizens showed insufficient abilities in reading, mathematics and science as measured by the OECD's PISA study ([9]). Test results were best for reading, with a 19.7 % share of low achievers, followed by science with 20.6 % and maths with 22.2 %. Figure 4.7 shows how the overall performance in reading, maths and science varied significantly across countries. It also indicates that performance is highly correlated across all three areas of basic skills. Member States that show certain levels of basic skills in one of the areas tend to show a similar value in the other areas.

The share of pupils failing to acquire competences in the key subjects surpassed 36 % in Bulgaria, Cyprus and Romania. However, only two countries (Estonia and Finland) reached the ET 2020 benchmark and had a share of low achievers, with levels below 15 %. In general, there is no clear geographical pattern, with a number of eastern Member States performing better than the EU average while some northern and western Member States show lower rates.

Compared with international competitors, the EU's overall share of low achievers in reading and science was similar to that of the United States while in maths US pupils performed significantly worse (29.4 %). However, it was higher than for Japan and South Korea, where the shares of low-achieving pupils were below 13 % and 16 % respectively.

According to the European Commission's PISA 2015 ([10]) report, the EU as a whole is seriously lagging behind the 2020 target to have less than 15 % of low achievers in each of the three basic skill areas. The report also shows that progress

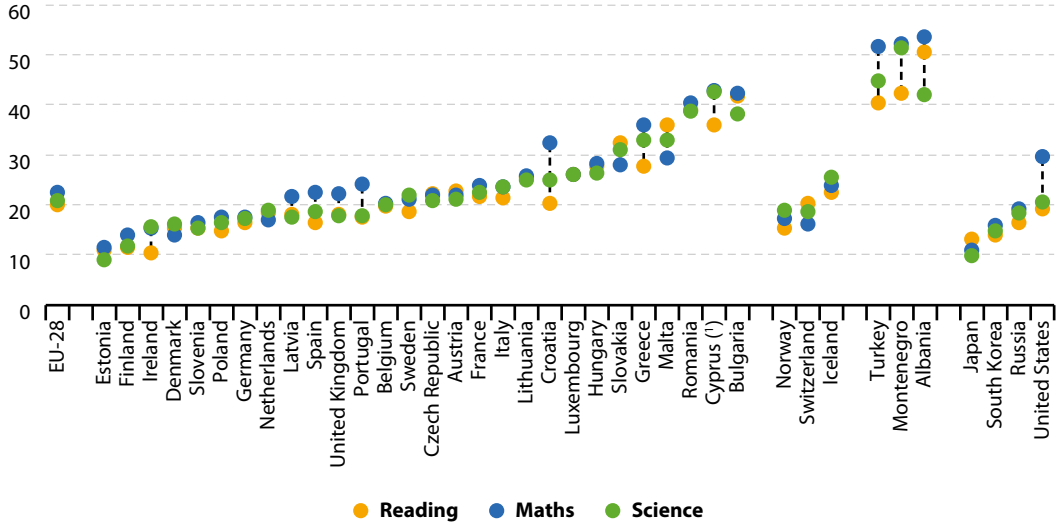
Figure 4.6: Participation in early childhood education, EU-28, 2002–2015 ([1])
(% of the age group between 4 years old and the starting age of compulsory education)



([1]) Break in time series in 2013 (switch from ISCED 1997 to ISCED 2011); 2015 data are estimates; ET 2020 benchmark for the EU: at least 95 %.
Source: Eurostat (online data codes: tps00179 and educ_uoe_enra10)

([9]) PISA is an international study that was launched by the OECD in 1997. It aims to evaluate education systems worldwide every three years by assessing 15-year-olds' competencies in the key subjects: reading, mathematics and science. For further details see http://www.oecd.org/pisa/
([10]) European Commission, *PISA 2015: EU performance and initial conclusions regarding education policies in Europe*, 2016 (p. 3).

Figure 4.7: Low achievers in reading, maths and science, by country, 2015
(Share of 15-year-old pupils who are below proficiency level 2 on the PISA scales for reading, maths and science)



(1) Data relate to the area under the effective control of the Government of the Republic of Cyprus.
Source: OECD/PISA (online data code: tsdsc450)

has taken a step backwards, with the rate of low achievers increasing since the PISA 2012 results by 4 percentage points in science, 1.9 percentage points in reading and 0.1 percentage points in maths.

In general, gender differences are not as large as they used to be. The gender gap in the share of low achievers in maths (girls: 23.2 %, boys: 21.2 %) and science (girls: 20.4 %, boys: 20.7 %) continues to be small. The gap between boys and girls for reading (girls: 15.9 %, boys: 23.5 %) has narrowed significantly. In addition to basic skills in reading, maths and science, the ability of citizens to communicate in at least two languages besides their mother tongue has been identified as a key priority in the ET 2020 framework. The European Commission has proposed monitoring student proficiency in the first foreign language and the uptake of a second foreign language at lower secondary level. Member States must ensure the quantity and quality of foreign language education is scrutinised and that teaching and learning are geared towards practical, real-life application ([11]). Foreign language skills should be taken into account in the effort to equip young people with the competences needed to meet labour market demands.

Schools teach foreign languages in all Member States, making language learning a central element in every child's school experience across Europe. On average, 16.3 % of pupils across the EU in primary education (ISCED level 1) were not engaged in foreign language learning at this level in 2014 ([12]). This number was higher in 2013, with 18.3 %. Looking at students in lower secondary education (ISCED level 2), the share learning no foreign language dropped to 1.4 % across the EU. On the other hand, students learning one foreign language reached nearly 40 % and students learning two or more foreign languages reached almost 59 % in 2015.

([11]) The Member States play an important role in the development of national assessments of language learning. See in particular the May 2014 Council Conclusions on Multilingualism and the development of language competence.
([12]) Data source: Eurostat (online data code: educ_uoe_lang02)

4.3 Increasing attainment at tertiary level

Between 2002 and 2016, the share of 30 to 34 year olds having completed tertiary education grew continuously from 23.6 % to 39.1 %. Growth was considerably faster for women, who in 2016 were already clearly above the Europe 2020 target at 43.9 %. In contrast, among 30 to 34 year old men the share was 34.4 % in 2016.

The share of adults participating in learning does not seem to be increasing fast enough to meet the ET 2020 benchmark of raising participation to at least 15 % by 2020. Over the last four years, the share stagnated between 10.7 % (2013, 2015) and 10.8 % (2014, 2016).

4.3.1 The share of tertiary graduates keeps on growing

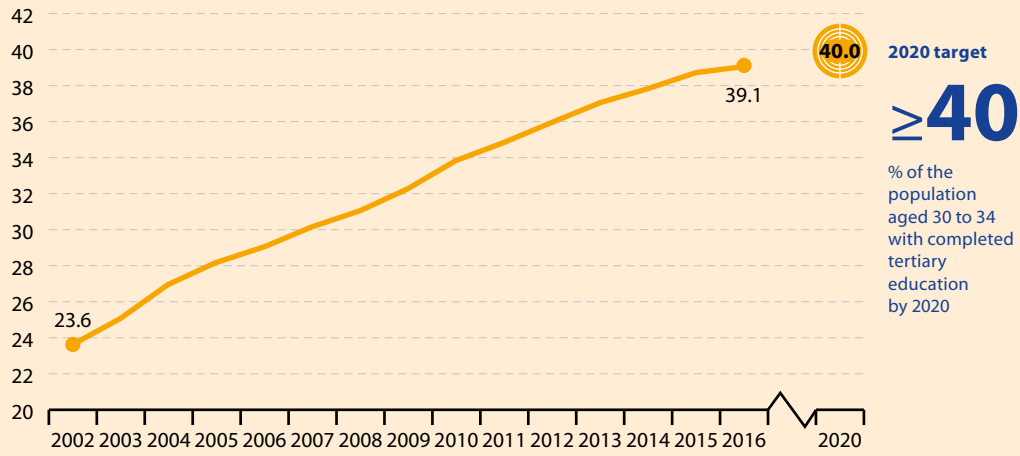
The second Europe 2020 education target — raising the share of the population aged 30 to 34 that have completed tertiary or equivalent education to at least 40 % — is monitored with the headline indicator on tertiary educational attainment of the same age group ([13]).

Figure 4.8 shows a steady and considerable growth in the share of 30 to 34 year olds who have successfully completed a university degree or other tertiary-level education since 2002.

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

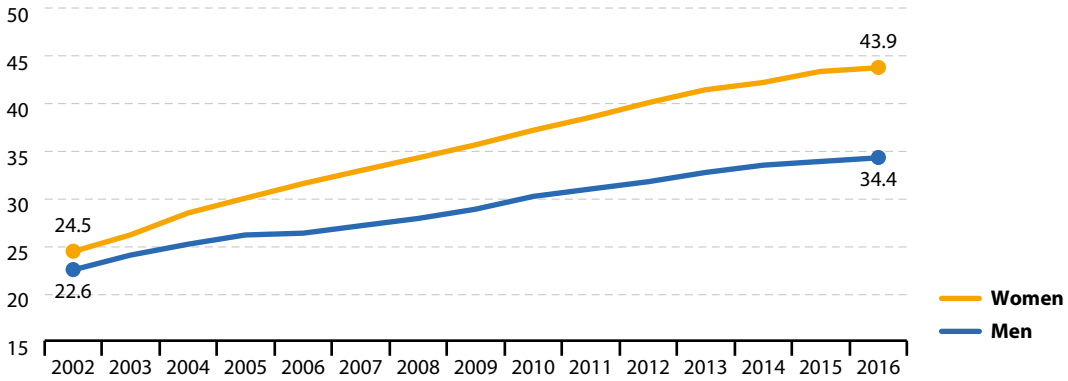
Figure 4.8: Tertiary educational attainment, EU-28, 2002–2016 ([1])
(% of the population aged 30–34 with completed tertiary education)



([1]) Break in time series in 2014 (switch from ISCED 1997 to ISCED 2011); Europe 2020 target: at least 40%.
Source: Eurostat (online data code: t2020_41)

([13]) Educational attainment is defined according to the International Standard Classification of Education (ISCED). Tertiary educational attainment refers to ISCED 2011 level 5–8 (for data as from 2014) and to ISCED 1997 level 5–6 (for data up to 2013).

Figure 4.9: Tertiary educational attainment, by sex, EU-28, 2002–2016 (1)
(% of the population aged 30–34 with completed tertiary education)



(1) Break in time series in 2014 (switch from ISCED 1997 to ISCED 2011).
Source: Eurostat (online data code: t2020_41)

The share of 39.1 % in 2016 implied a growth of 15.5 percentage points since 2002.

4.3.2 Tertiary education attainment rate is considerably higher for women

Figure 4.9 shows a significantly widening gender gap among graduates from tertiary education across the EU. While in 2002 the share of tertiary graduates was similar for both sexes, the share of female graduates has since grown at almost twice the rate. In 2016, women outnumbered men significantly in almost all Member States. In fact, the gender gap was more than 10 percentage points in 21 countries, with Latvia, Lithuania and Slovenia showing the highest gaps of over 20 percentage points. Germany was the most 'equal' country with a gender gap of only 0.4 percentage points in favour of men.

4.3.3 All Member States made significant progress in raising tertiary educational attainment

The increase in tertiary educational attainment levels across the EU is mirrored across all Member States. This to some extent reflects countries' investment in higher education to meet demand for a more skilled labour force. Another factor is the shift to shorter degree programmes following implementation of Bologna (14) process reforms in some countries.

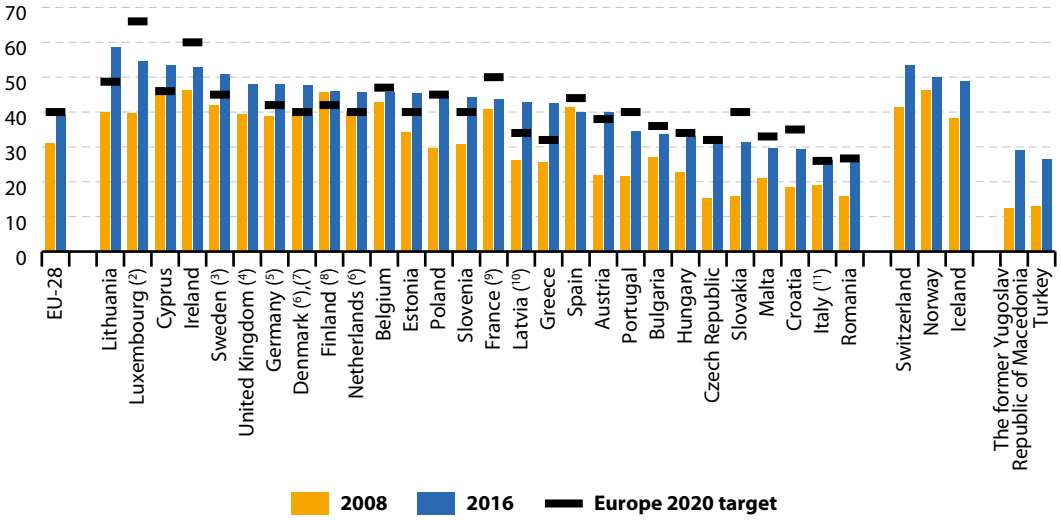
National targets for tertiary education range from 26 % for Italy to 66 % for Luxembourg. Germany's target is slightly different from the overall EU target because it includes post-secondary, non-tertiary attainment (ISCED level 4). For France, the target definition refers to the 17 to 33 year age group while for Finland the target excludes former tertiary vocational education and training (VET).

Figure 4.10 shows that in 2016, 13 countries had already achieved their national targets. Belgium, Hungary, Poland and Romania were close at less than two percentage points from their national targets while Luxembourg and Slovakia were the most distant, at 11.4 and 8.5 percentage points, respectively, below their targets.

In 2016, levels of tertiary educational attainment varied by a factor of about 2.3 across Europe. Northern and central Europe had the highest percentage of tertiary graduates, with 18 countries exceeding the overall EU target of 40 %. The

(14) The Bologna process put in motion a series of reforms to make European higher education more compatible, comparable, competitive and attractive for students. Its main objectives were: the introduction of a three-cycle degree system (bachelor, master and doctorate); quality assurance; and recognition of qualifications and periods of study (source: Education and training statistics introduced (accessed 25 April 2016)).

Figure 4.10: Tertiary educational attainment, by country, 2008 and 2016
(% of the population aged 30–34 with completed tertiary education)



(1) All countries: break in time series in 2014 (switch from ISCED 1997 to ISCED 2011, data are comparable for all countries except AT.
(2) Break in time series in 2015.
(3) Target: 45–50 %.
(4) No target in National Reform Programme.
(5) Data and target refer to ISCED 2011 levels 4–8.
(6) Target: more than 40 %.
(7) Break in time series in 2016.
(8) Target: excluding former tertiary Vocational Education and Training (VET).
(9) Target refers to 17–33 year-olds.
(10) Target: 34–36 %.
(11) Target: 26–27 %.

Source: Eurostat (online data code: t2020_41)

lowest levels could be observed in Italy and Romania, which were both around 26 %.

At the same time, some eastern European countries experienced the strongest increases over the period 2008 to 2016. Changes were most pronounced in Latvia, Greece and the Czech Republic where the shares almost doubled.

Looking at non-EU Europe, the EFTA countries Norway, Switzerland and Iceland were at the level of the best performing Member States in 2016. However, the candidate countries The former Yugoslav Republic of Macedonia and Turkey showed tertiary educational attainment levels similar to southern and eastern Member States.

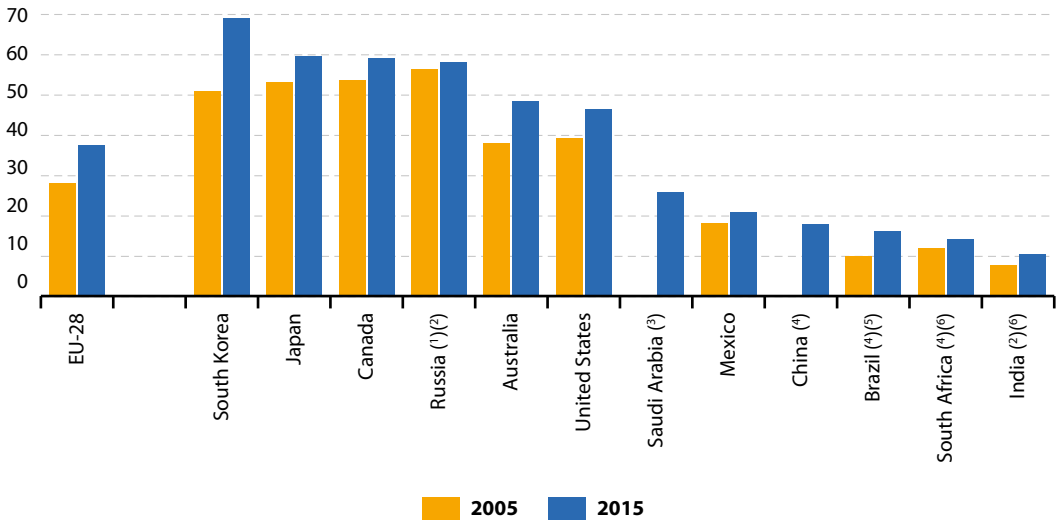
Across other major world economies ([15]), the tertiary attainment rates vary greatly, but all countries showed clear increases between 2005 and 2015 (see Figure 4.11). South Korea experienced the biggest rise, with 18 percentage points.

4.3.4 Country-specific participation in adult learning varies greatly

In addition to tertiary educational attainment, adult participation in learning is also crucial for providing Europe with a highly qualified labour force. Adult education and training covers the longest time span in the process of learning throughout a person's life. After an initial phase of education and training, continuous, adult learning is crucial for improving and developing skills, adapting to technical developments, advancing careers or returning to the labour market (also see the chapter on 'Employment', page 25). In recognition of this, adult participation in learning plays a crucial role in the Europe 2020 flagship

([15]) The data in Figure 4.11 refers to the age group 25–34, because the OECD database does not include the age group 30–34 that is used for the Europe 2020 target.

Figure 4.11: Tertiary educational attainment rate, age group 25–34, by country, 2005 and 2015
(%)



(1) 2011 data instead of 2005.
(2) 2013 instead of 2015.
(3) 2014 data only.
(4) 2010 data instead of 2015.
(5) 2007 data instead of 2005.
(6) 2009 data instead of 2005.

Source: OECD and Eurostat (online data code: lfsa_pgaed)

initiative 'An Agenda for new skills and jobs' and played an important role in the concluded initiative 'Youth on the move'. In addition, the European Council in 2011 adopted a resolution on a renewed European agenda for adult learning [16]. The EU's ET 2020 framework also includes a benchmark that aims to raise the share of adults participating in learning to at least 15 %. This benchmark refers to people aged 25 to 64 who stated they received education or training in the four weeks preceding the survey.

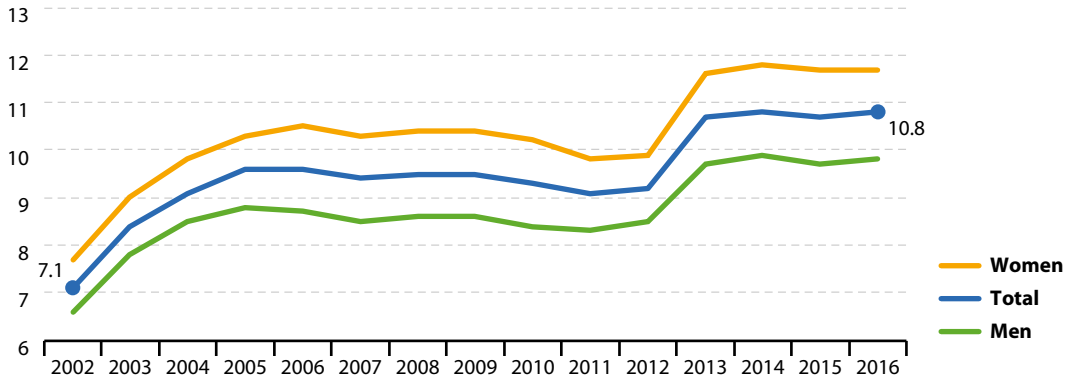
After growing between 2003 and 2005, the share of EU adults participating in learning fell slightly to 9.2 % in 2012 (see Figure 4.12). It increased to 10.7 % in the following year, but this rise was mainly influenced by a methodological change to the French Labour Force Survey [17]. In the last four years, the share stagnated between 10.7 % (2013, 2015) and 10.8 % (2014, 2016).

In most Member States, adult participation in learning stagnated or changed marginally between 2013 and 2016. Estonia showed the largest difference, where the rate increased by 3.1 percentage points. The United Kingdom experienced the largest fall of 2.2 percentage points. Overall, there are clear regional differences. The Scandinavian countries Sweden (29.6 %), Denmark (27.7 %) and Finland (26.4%) stand out with the highest rates, followed by western Member States such as France, the Netherlands (both 18.8 %) and Luxembourg (16.8 %). At the other end of the scale, Romania and Bulgaria had low shares of 1.2 % and 2.2 %. In general, adult learning seems to be a less common form of educational attainment in eastern and southern European countries.

Women are more likely to participate in adult learning than men. In 2016, the share of adult

[16] Council Resolution on a renewed European agenda for adult learning (2011/C 372/01), Official Journal of the European Union.
[17] INSEE, the French Statistical Office, has carried out an extensive revision of the questionnaire of the Labour Force Survey. The new questionnaire was used from 1 January 2013 onwards. It impacts significantly the level of various French LFS-indicators.

Figure 4.12: Adult participation in learning, EU-28, 2002–2016 ([1])
(% of population aged 25 to 64) ([2])



([1]) Breaks in time series in 2003, 2006 and 2013. ET 2020 benchmark for the EU: at least 15 %.
([2]) Adult participation in learning refers to people aged 25 to 64 who stated they received education or training in the four weeks preceding the survey (numerator). The denominator consists of the total population of the same age group, excluding those who did not answer to the question 'participation in education and training'.

Source: Eurostat (online data code: tsdsc440)

women engaged in learning was nearly 2 percentage points higher than that of men (11.7 % compared with 9.8 %). Women recorded higher participation rates in all Member States except for Germany and Croatia, where a slightly higher share of adult men were engaged in learning. Greece and Romania showed no perceivable difference in gender participation rates. Interestingly, the two countries with the highest shares in general had the largest gender differences: Sweden with 14.0 percentage points and Denmark with 9.9 percentage points.

Overall, the rates are higher for adults participating in learning in another Member State than the one they were born in (11.7 % in 2016). This may reflect participation in targeted learning activities such as language courses. It may also be linked to higher unemployment rates among migrants in some countries, resulting in a greater participation in labour market integration programmes (see the chapter on 'Employment', page 25).

There is a clear gradient of adult participation in learning and a person's educational attainment. In 2016, adults with at most lower secondary education were less engaged in learning (4.2 %) than those with upper secondary (8.8 %) or tertiary education (18.6 %).

In relation to labour status, employed people in general show a slightly higher participation rate. Some 11.6 % of employed 25 to 64 year olds took part in adult learning in 2016. Among unemployed people, the rate was slightly lower than the total participation rate, at 9.6 %.

4.4 Educational levels of the population

Educational attainment is the visible output of education systems. In general, younger people show higher educational levels than the older age group. And across all age groups, migrants born outside the EU (extra-EU migrants) have a much higher prevalence of low educational levels (ISCED 0–2) than people living in their country of birth or coming from another EU country (intra-EU migrants).

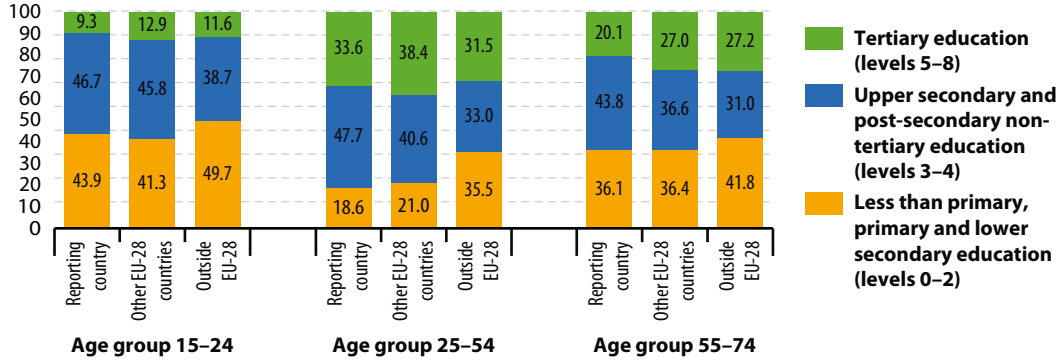
Educational attainment is the visible output of education systems. Achievement levels can have major implications for many issues affecting a person's life. This is reflected in adult participation in learning as well as in other aspects presented in the chapters on 'Employment', page 25, and 'Poverty and social exclusion', page 129.

Figure 4.13 shows the educational attainment level of different population groups. The age group 25 to 54 shows higher educational levels than the 55 to 74 age group, which reflects the growing demand for a more highly skilled workforce in most parts of Europe over the past few decades. A more skilled workforce is expected to emerge as older generations leave the workforce and are replaced by younger, more highly educated ones. If labour markets do not provide adequate jobs this may result in higher levels of over-qualification and youth unemployment. For workers aged 55 and older, lower educational attainment levels, especially among women, highlight the importance of adult learning to increase their employability and to help meet the Europe 2020 strategy's employment target (see the chapter on 'Employment', page 25).

Across all age groups, migrants born outside the EU (extra-EU migrants) have a much higher prevalence of low educational levels (ISCED 0–2) than people living in their country of birth or coming from another EU country (intra-EU migrants). The reverse pattern can be observed for the medium education levels (ISCED 3–4). This rate is significantly lower for people from outside the EU, especially in the age group 25 to 54. Interestingly, the tertiary education rate for extra-EU migrants is similar to or higher than the rate for natives, while the tertiary education rate for intra-EU migrants is higher than for the native population.

Figure 4.13: Population by educational level, by age group and broad group of country of birth, EU-28, 2016

(%)



Source: Eurostat (online data code: edat_lfs_9912)

4.5 Employment rate of recent graduates

Education and training plays an important role in improving employability. The employment rate of recent graduates (20 to 34 year olds having left education and training in the past one to three years) has dropped considerably due to the economic and financial crisis. It fell from 82.0 % in 2008 to 75.4 % in 2013. However, it has increased clearly since 2013, reaching 78.2 % in 2016.

The EU's ET 2020 framework ([18]) acknowledges the important role of education and training in raising employability. As a consequence, the EU aims to ensure that at least 82 % of recent EU graduates (20 to 34 year olds) should have found employment no more than three years after leaving education and training (see Box 4.2).

Figure 4.14 shows how severely the economic crisis has affected recent graduates. Between 2008 and 2013, employment rates among 20 to 34 year olds who had left education and training in the past one to three years, and were not in further education or training in the four weeks preceding the survey, fell by 6.6 percentage points. In comparison, the decline in the overall employment rate for 20 to 64 year olds was 'only' 1.9 percentage points over the same period. However, 2013 seems to mark a turnaround in this trend, with the share of employed recent graduates increasing in the three following years, reaching 78.2 % in 2016.

The data in Figure 4.14 refer to graduates who left education and training with at least upper-secondary qualifications (ISCED levels 3–8). Breaking the data down by educational attainment reveals the fall in the employment rate had been slightly stronger for the lower educated cohort (– 4.4 percentage points from 2008 to 2016) than for those with a tertiary education (– 4.1 percentage points from 2008 to 2016).

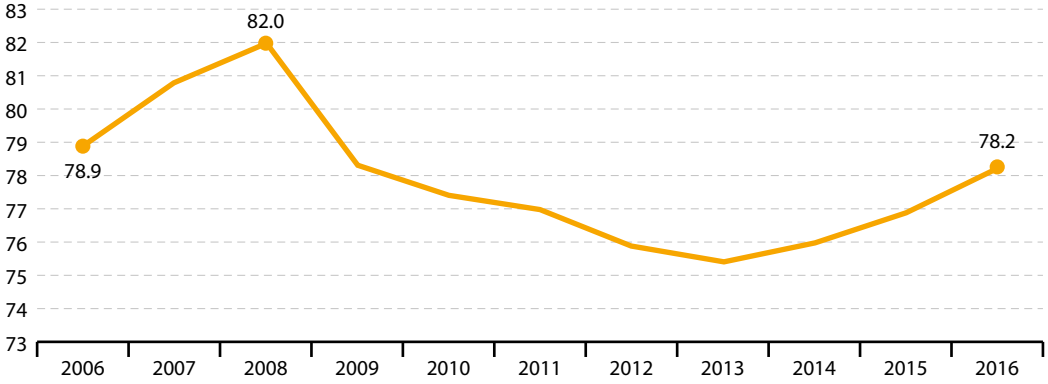
Box 4.2: Policies tackling the transition from education to employment

The EU employment package 'Towards a job-rich recovery' ([19]), under its objective of restoring the dynamics of labour markets, calls for 'security in employment transitions', such as in the transition of young people from education to work. It states: 'There is evidence to show that apprenticeships and quality traineeships can be a good means of gaining entry into the world of work, but there are also recurring examples of traineeships being misused.'

The employment package also reaffirms the European Commission's commitment to tackling the dramatic levels of youth unemployment by supporting the transition to work 'through youth guarantees, activation measures targeting young people, the quality of traineeships and youth mobility'.

([18]) Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020') (2009/C 119/02), Official Journal of the European Union.
([19]) European Commission, *Towards a job-rich recovery*, COM(2012) 173 final, Strasbourg, 2012 (p. 10).

Figure 4.14: Employment rate of recent graduates, EU-28, 2006–2016 ([1])
(Share of graduates (20–34 year olds) having left education and training in the past 1–3 years who are employed and not in any further education or training)



([1]) Data refer to graduates having left education and training with at least upper secondary qualifications (ISCED 3–8); break in time series in 2014 (switch from ISCED 1997 to ISCED 2011). ET 2020 benchmark for the EU: at least 82 %.

Source: Eurostat (online data code: edat_lfse_24)

4.6 Investment in future generations: the case of public expenditure on education

In 2014, public expenditure on education as a percentage of GDP in the EU was highest for primary and lower secondary education (levels 1 and 2) and lowest — for early childhood and education.

Public expenditure on education as a percentage of GDP is often considered an indicator of a government's commitment to developing skills and competences. Generally, the public sector funds education either by directly bearing the current and capital expenses of educational institutions or by supporting students and their families with scholarships and public loans as well as by transferring public subsidies for educational activities to private firms or non-profit organisations. Both types of transactions together are reported as total public expenditure on education.

Figure 4.15 shows the total public expenditure on education as a share of GDP in 2014. Data for all four education levels are available for 25 Member States. Nonetheless, all 26 Member States for which data are at least partly available have been included in the following analysis ([20]).

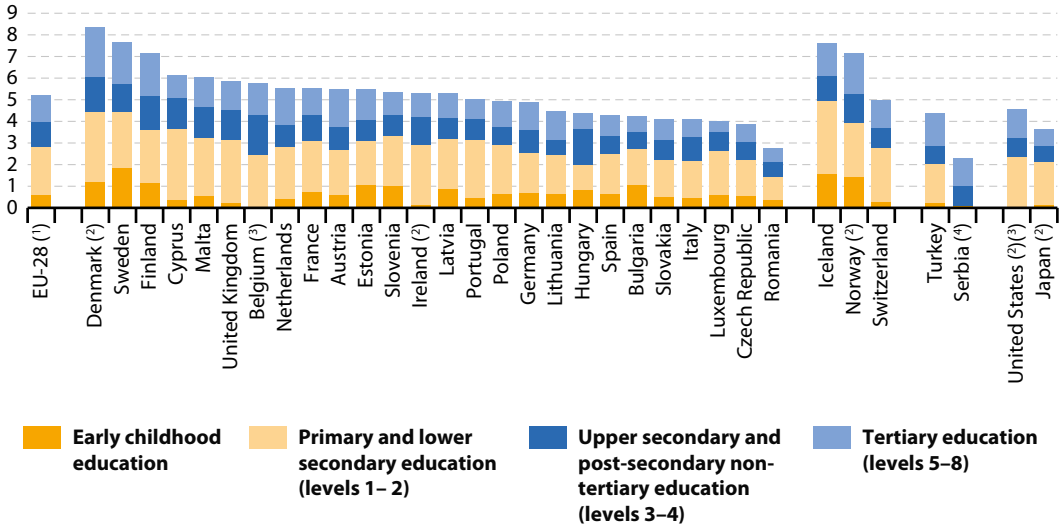
The highest share of public expenditure on education can be observed in Denmark (8.3 % of GDP), followed by Sweden (7.7 %) and Finland (7.2 %). The lowest proportions were reported by Romania (2.8 %), the Czech Republic (3.8 %) and Luxembourg (4.0 %).

Across the EU, public expenditure was highest for primary and lower secondary education (levels 1 and 2). As a share of GDP, this ratio ranged from 1.1 % in Romania to 3.3 % in Cyprus and Denmark.

By contrast, in nearly all countries, the smallest share of public expenditure on education went to

([20]) No data are available for Croatia and Greece.

Figure 4.15: Total public expenditure on education by education level, by country, 2014
(% of GDP)



(1) Estimated data.
(2) 2013 data
(3) No data for ISCED level 0.
(4) No data for ISCED levels 1–2.

Source: Eurostat (online data code: educ_uoe_fine06)

early childhood education ([21]). This ratio ranged from 0.1 % in Ireland to 1.8 % in Sweden. In general, in eight of the 25 Member States, public expenditure on this level of education was less than 0.5 % of GDP.

For the two remaining categories (upper secondary and post-secondary non-tertiary education (levels 3 and 4) and tertiary education (levels 5 to 8), the differences were not as high as for the two lower categories. For upper secondary education (including also post-secondary non-tertiary levels), the range of public expenditure was equivalent to 0.7 % of GDP in Lithuania and Romania to 1.9 % of GDP in Belgium.

The proportion of financial resources devoted to the tertiary level varied between the 26 Member States for which data are available, ranging from 0.5 % in Luxembourg to 2.3 % in Denmark.

([21]) The analysis takes in consideration all ISCED0 levels (i.e. early childhood education development — ISCED01 and pre-primary education — ISCED02). Data on early childhood education development are not obligatory by the EU Regulation, therefore not provided by all countries.

4.7 Outlook towards 2020

Knowledge of current student cohorts and demographic projections allow educational trends to be estimated up to 2020 (see Box 4.3). This can help identify priority issues that may need particular political attention on the path to meeting the Europe 2020 targets.

The flagship initiative 'An Agenda for new skills and jobs' addresses the challenge of early leaving from education and training. In 2011, the European Council published recommendations on policies to reduce early leaving from education and training ([22]), giving guidance to Member States on the implementation of strategies and measures tackling this problem. Vocational Education and Training (VET) systems are seen as important for improving the employability of young people and reducing early leaving from education and training, by offering an interesting alternative to general education.

Additionally, the Europe 2020 strategy puts particular effort into making sure that higher education courses develop the skills relevant to the world of work, both for meeting future labour demand and for ensuring the long-term attractiveness of higher education. Moreover, the European Council's Resolution ([23]) on a renewed European agenda for adult learning addresses the challenge of raising participation rates of adults in learning activities.

Box 4.3: Projections up to 2020 in relation to the Europe 2020 education targets

Based on the most recent data for early school leaving and tertiary education, the European Commission has published projections of the likelihood that Europe 2020's education targets will be met by 2020:

- The EU average early school leaving rate in 2010 was 13.9 % and would need to be below 10 % by 2020, ten years later. It follows from a basic calculation that the minimum annual progress required for the EU as a whole during this period is – 3.3 %, whereas the observed annual progress for the EU between 2010 and 2016 has been – 3.8 %. This means that overall the EU is on track to meeting the headline target if current progress is sustained.
- The EU average tertiary attainment rate in 2010 was 33.8 % and it would need to reach 40 % ten years later. The resulting minimum annual progress required for the EU as a whole is 1.8 %, while the observed annual change between 2010 and 2016 has been considerably higher (2.5 %). This means the EU is well on track to reach its 40 % target by 2020 if recent progress can be sustained.

Of the 12.0 million 30 to 34 year olds with a tertiary education qualification, 7.2 million are women. This highlights a significant gender difference in relation to obtaining a high-level education. Moreover, this difference has been increasing, up by 0.3 percentage points from 2011. In fact, women, taken as a separate group, achieved the 40 % benchmark in 2012, eight years ahead of the 2020 target date.

([22]) Council recommendations of 28 June 2011 on policies to reduce early school leaving (2011/C 191/01), Official Journal of the European Union.
([23]) Council Resolution on a renewed European agenda for adult learning (2011/C 372/01).

5 Poverty and social exclusion

5.1 Poverty and social exclusion — why do they matter?

Poverty and social exclusion harm individual lives and limit the opportunities for people to achieve their full potential by affecting their health and well-being and lowering educational outcomes. This, in turn, reduces opportunities to lead a successful life and further increases the risk of poverty. Without effective education, health, social, tax benefit and employment systems, the risk of poverty is passed on from one generation to the next. This causes poverty to persist and hence creates more inequality, which can lead to long-term loss of economic productivity from whole groups of society ([1]) and hamper inclusive and sustainable economic growth.

To prevent this downward spiral, the European Commission has made 'inclusive growth' one of the three priorities of the Europe 2020 strategy. It has set a target to lift at least 20 million people out of the risk of poverty or social exclusion by 2020. To underpin this objective, the European Commission has launched two flagship initiatives under the 'inclusive growth' priority: the 'Agenda for new skills and jobs' and the 'European platform against poverty and social exclusion'. Furthermore, between 2010 and 2014 a package of policy initiatives 'Youth on the move' was instated to enhance the performance of education systems and help young people find work. Also, Member States have made a commitment through the 'Youth guarantee' programme to enhance employment and further training opportunities for young people across the EU.

By setting a poverty target, the EU has put social concerns on equal footing with economic objectives. Achieving the target to reduce the number of people at risk of poverty or social exclusion will depend on the successful implementation of other priorities of the Europe 2020 strategy, such as providing better opportunities for employment and education (see the chapters on 'Employment', page 25, and 'Education', page 107).

Europe 2020 strategy target on the risk of poverty or social exclusion

The Europe 2020 strategy has set the target of 'lifting at least 20 million people out of the risk of poverty or social exclusion' by 2020 compared to the year 2008 ([2]).

This chapter analyses the EU's progress in reducing poverty, which is monitored through the headline indicator '**people at risk of poverty or social exclusion**'. As poverty is a multidimensional issue, the full picture is captured by three sub-indicators that constitute the headline indicator: **monetary poverty**, **severe material deprivation** and **very low work household intensity**. The aim of including other components of social exclusion alongside relative monetary poverty is to highlight that other factors in addition to low income also lead to severe and chronic disadvantages and that these are all closely intertwined. This chapter also includes breakdowns of the headline indicator by sex, age, labour status, household type, educational level, parents' educational level, country of birth and degree of urbanisation of residential municipality to reveal a broader picture and to show the drivers behind the changes observed.

([1]) European Commission, *Social trends and dynamics of poverty*, ESDE conference, Brussels, 2013.

([2]) Due to the structure of the survey on which most of the key social data is based (EU Statistics on Income and Living Conditions), a large part of the main social indicators available in 2010, when the Europe 2020 strategy was adopted, referred to 2008 as the most recent year of data available. This is why 2008 data for the EU-27 are used as the baseline year for monitoring progress towards the Europe 2020 strategy's poverty target. Since 115.9 million people were at risk of poverty or social exclusion in the EU-27 in 2008, the target value to be reached is 95.9 million by 2020.

Poverty and social exclusion in the EU

People at risk of poverty or social exclusion

rose from **117.7 million people** in 2010

to **118.8 million people** in 2015

2020 target:
Lift at least 20 million people out of the risk of poverty or social exclusion (1)

see page 132

... by sex
women, %

2010	2015
24.8	24.4

see page 143

... by age group
age group 18–24, %

2010	2015
29.3	31.3

see page 144

... by activity status
age group 18+, unemployed, %

2010	2015
64.5	66.6

see page 145

... by household type
single parent households, %

2010	2015
52.1	47.9

see page 145

... by education
age group 18+, lower secondary education at most, %

2010	2015
32.7	34.7

see page 146

... children, by educational attainment level of their parents
age group 0–18, lower secondary education at most, EU-28, %

2010	2015
59.8	65.6

see page 147

... by country of birth
age group 18+, migrants from outside the EU-28, % (2)

2010	2015
36.9	40.2

see page 149

... by degree of urbanisation
rural areas, % (2)

2010	2015
29.0	25.5

see page 150

(1) The target refers to 2008 EU-27 levels, resulting in an absolute target value of 95.9 million people. Due to data availability, the target is evaluated only for EU-27.
(2) Estimated.

5.2 How do poverty and social exclusion affect Europe?

The number of people living in poverty or social exclusion has fallen since the economy started recovering in 2013. Nevertheless, almost every fourth person in the EU still experiences at least one of the three forms of poverty or social exclusion, showing there is some way to go to meet the Europe 2020 strategy target.

Monetary poverty is the most widespread form of poverty, affecting 17.3 % of EU residents in 2015. Severe material deprivation and very low work intensity follow, affecting 8.1 % of the EU population and 10.6 % of EU residents aged 0 to 59, respectively.

Developments in the headline indicator were mainly driven by a reduction in the number of people living in severe material deprivation. While monetary poverty has been moderately but steadily increasing and very low work intensity has not changed drastically since 2010, material deprivation has followed the same path as the headline indicator.

The share of the population at risk of poverty or social exclusion increased in 16 Member States between 2008 and 2015. While three countries using this measure for their national poverty targets had already reached their goals in 2015, others have yet to do so.

In most EU countries, the share of people affected by monetary poverty increased between 2008 and 2015. On average, monetary poverty is lower in the EU at 17.3 % than in many other advanced economies. In most non-European OECD countries, this value was roughly between 20 % and 25 %.

The degree to which monetary poverty was reduced by providing social transfers in Member States varied between 19.9 and 3.9 percentage points. Overall, social transfers decreased monetary poverty in the EU by 8.7 percentage points in 2015.

Across the EU, severe material deprivation affected 8.1 % of the population in 2015.

Although the overall EU share of people living in households with very low work intensity has remained relatively stable at 10.6 % since 2010, the country-specific levels and developments have differed widely. Moreover, being in work does not necessarily protect against poverty: in 2015, 7.7 % of the EU's working population was at risk of poverty even though they were working full time.

5.2.1 The rate of poverty or social exclusion in the EU has returned to around the 2008 level, yet progress remains limited

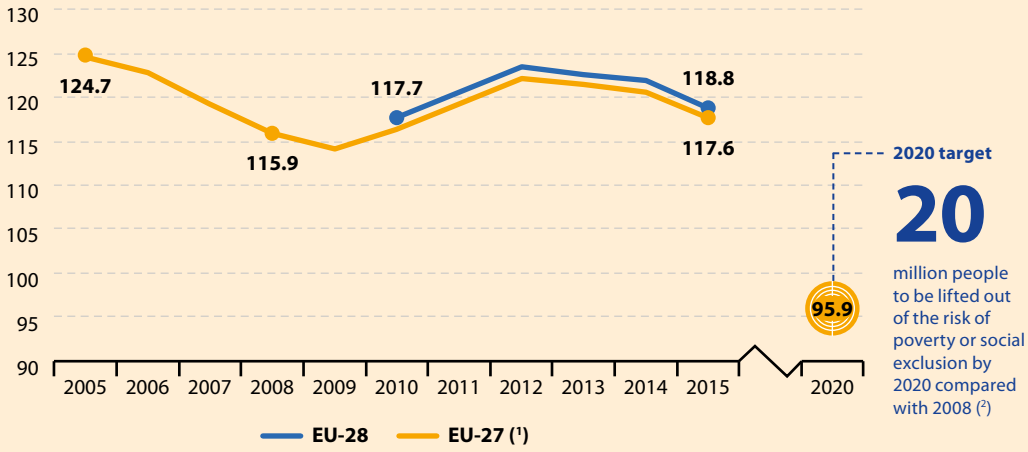
In 2015, almost 119 million people, or 23.7 % of the EU population, were at risk of poverty or social exclusion. This means roughly one in four people in the EU experienced at least one of the following three forms of poverty or social exclusion: monetary poverty, severe material deprivation, or very low work household intensity.

The development of risk of poverty or social exclusion (see Box 5.1) in the EU over the past decade has been marked by two turning points: in 2009, when the number of people at risk started to rise because of the delayed social effects of the economic crisis and in 2012, when this upward

EUROPE 2020 HEADLINE INDICATOR

Europe 2020 headline indicator

Figure 5.1: People at risk of poverty or social exclusion, EU-27 and EU-28, 2005–2015
(million persons)



(1) Data for 2005, 2006 are estimates
(2) The overall EU target (referring to the EU-27 — the 27 EU countries before the accession of Croatia) is to lift at least 20 million people out of the risk of poverty or social exclusion by 2020. Due to the structure of the survey on which most of the key social data is based (EU Statistics on Income and Living Conditions), a large part of the main social indicators available in 2010, when the Europe 2020 strategy was adopted, referred to 2008 as the most recent year of data available. For this reason progress towards the Europe 2020 strategy's poverty target is monitored using 2008 as the baseline year.

Source: Eurostat (online data code: t2020_50)

trend reversed (3). By 2015, the number of people at risk had fallen almost to the 2008 level, reaching 117.6 million people for the EU-27 and 118.8 million people for the EU-28 (see Figure 5.1).

Following the onset of the economic crisis automatic stabilisers as well as other discretionary measures implemented by EU governments were used to cushion the recession's negative social effects. While discretionary measures, such as increased spending by the government and tax breaks, constitute policy responses to crises, automatic stabilisers, such as unemployment programmes and progressive taxes that increase the tax-base during economic expansion, are elements of fiscal policy that reduce tax burdens and increase public spending without immediate government actions (4).

Since 2013, the EU has experienced a moderate economic recovery. This was mainly spurred by low energy prices, elevating households' purchasing power, and the depreciation of the euro, which helped European exports. Gradual improvements in labour markets also accompanied the economic recovery (as shown in the European Commission's Economic Forecast Autumn 2016 (5)). For more information see also the chapter on 'Employment', page 25, and the European Commission's Annual Review on Employment and Social Developments (6).

(3) For trends since 2009, see European Commission Directorate General for Economic and Financial Affairs, *Poverty developments in the EU after the crisis: a look at main drivers*, Economic Brief, Issue 31, May 2014.
(4) Dolls et al, *Automatic stabilization and discretionary fiscal policy in the financial crisis*, IZA Journal of Labor Policy, 2012, 1:4.
(5) European Commission, *European Economic Forecast Autumn 2016*, Institutional Paper 038, 2016.
(6) European Commission, *Employment and Social Developments in Europe, Annual Review*, 2016.

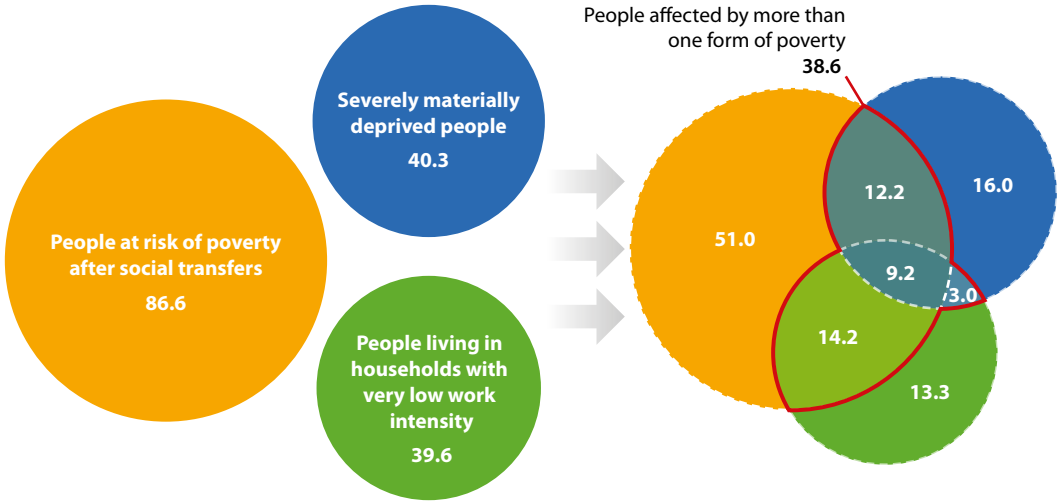
Box 5.1: What is social exclusion?

In its 2011 edition of Employment and Social Developments in Europe ([7]), the European Commission defines social exclusion as 'a process whereby certain individuals are pushed to the edge of society and prevented from participating fully by virtue of their poverty, or lack of basic competencies and life-long learning opportunities, or as a result of discrimination. This distances them from job, income and education and training opportunities as well as social and community networks and activities. They have little access to power and decision-making bodies and thus often feel powerless and unable to take control over the decisions affecting their day-to-day lives'.

Measuring poverty and social exclusion requires a multidimensional approach. While household income has a big impact on living standards, other aspects, such as access to labour markets and material deprivation, also prevent full participation in society. To address this, a broad 'at-risk-of-poverty or social exclusion rate' indicator was proposed by the European Commission and adopted by the European Council to serve the purposes of the Europe 2020 strategy. This indicator is an aggregate of three sub-indicators: monetary poverty, severe material deprivation and very low work intensity (the latter is limited to people aged 0 to 59).

Because these three dimensions of poverty tend to overlap, they cannot simply be added up to give the total number of people at risk of poverty or social exclusion. Some people are affected by two or even all three types of poverty, therefore taking the sum of each would lead to cases being double-counted. This becomes clear when

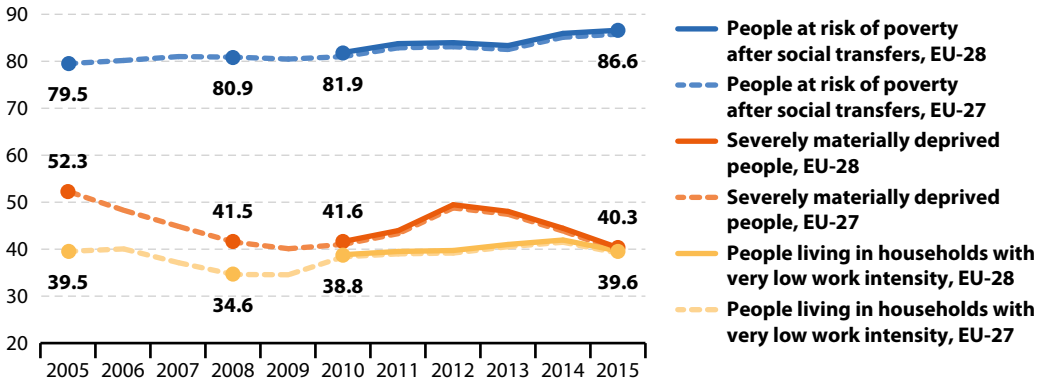
Figure 5.2: Aggregation of sub-indicators of 'people at risk of poverty or social exclusion', EU-28, 2015
(million people)



Source: Eurostat (online data codes: t2020_51, t2020_52, t2020_53 and ilc_pees01)

([7]) European Commission (Directorate-General for Economic, Social Affairs and Inclusion), *Employment and Social Developments in Europe 2011*, Publications Office of the European Union, Luxembourg, 2012 (p. 144).

Figure 5.3: Sub-indicators of 'people at risk of poverty or social exclusion', EU-27 and EU-28, 2005–2015 ([1])
(million people)



([1]) EU-27 data for 2005 and 2006 are estimates; EU-27 data for 2009 for 'severe material deprivation' are estimates.
Source: Eurostat (online data codes: t2020_51, t2020_52 and t2020_53)

looking at the current number of people at risk of poverty or social exclusion (see Figure 5.2). Therefore people are counted only once in the headline indicator, even if they fall into more than one category.

As Figure 5.2 shows, monetary poverty was the most widespread form of poverty in 2015, with 86.6 million people (17.3 % of the EU population) **living at risk of poverty after social transfers**. This was more than twice as many as those with **severe material deprivation** (40.3 million people or 8.1 % of EU citizens) and **very low work intensity** ([8]) (39.6 million people or 10.6 % of the EU population aged 0 to 59).

Almost 39 million people, or nearly one third (32.5 %) of all people at risk of poverty or social exclusion, were affected by more than one dimension of poverty over the same period. Another 9.2 million people, or one in twelve of those at risk of poverty or social exclusion (7.7 %), were affected by all three forms ([9]).

As shown in Figure 5.3, the three forms of poverty followed different trends between 2005 and 2015. While monetary poverty has been increasing gradually since 2005, the other two sub-indicators have not followed such a steady path. The number of people aged 0 to 59 living in households with very low work intensity declined between 2006 and 2008, but has since returned to the previous levels. Meanwhile, the number of severely materially deprived people has shown the largest swings compared to both 2005 and 2012, following a similar pattern to the headline indicator with significant reductions in recent years (see Figure 5.1). This suggests that the reduction in material deprivation was the main driver behind the improvement in the headline indicator since the start of the economic recovery. As will be described later in the chapter, the decline in the amount of materially deprived people was mainly driven by improvements in a handful of countries.

One possible reason for the divergence between monetary poverty and the two other forms of poverty is the different nature of the indicators. While monetary poverty is measured in relative terms, material deprivation and low work intensity

([8]) The dimension 'very low work intensity' is only measured among those aged 0 to 59. Therefore people older than 59 are considered at risk of poverty or social exclusion only if the criteria of one of the two dimensions 'monetary poverty' or 'severe material deprivation' are met.
([9]) The year of reference differs for the three sub-indicators. The risk of poverty after social transfers and whether or not someone lives in a household with very low work intensity are based on data from the previous year. The extent to which an individual is severely materially deprived is determined based on information from the year of the survey.

are absolute measures (see Box 5.2). The relativity of monetary poverty means the at-risk rate may remain stable or even increase even though the average or median equivalised disposable income ([10]) increases. This is because the monetary poverty threshold is set at a specific percentage of the median disposable income. That means that if the median income increases, but the inequality of the income distribution remains unchanged or even increases, the number of people below the poverty line does not decrease. Absolute poverty measures reflecting a person's ability to afford basic goods, however, are likely to decrease during economic revivals when people are generally more financially better off.

Box 5.2: Measuring poverty in absolute and relative terms

Absolute poverty refers to the deprivation of basic human necessities for survival, such as food, clean water, clothing, shelter, health care and education. This poverty line is considered the same for different countries, cultures and technological levels and it is often based on a given basket of goods and services. For example, absolute poverty can be measured as the number of people eating less food than needed to sustain the human body.

Relative poverty occurs when someone's standard of living and income are much worse than the general standard in the country or region they live in. They may struggle to live a normal life and to participate in ordinary economic, social and cultural activities. Relative poverty measures depend on the standard of living enjoyed by most people in the country. For example, it can be measured by the number of people living below a country-specific poverty threshold. Relative poverty measures are often closely linked to inequality ([11]).

5.2.2 The number of people at risk of poverty or social exclusion has increased in most Member States

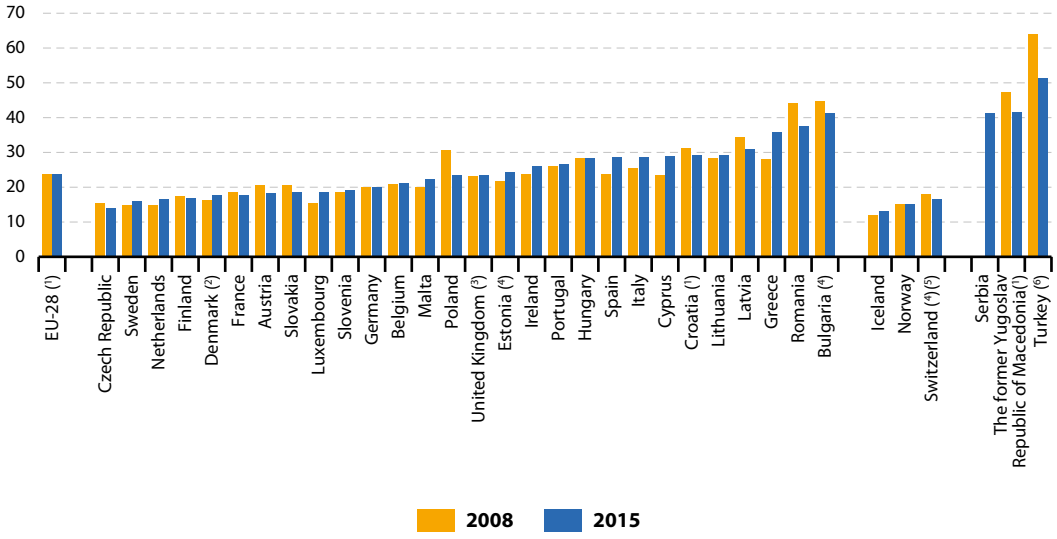
Although on average 23.7 % of the EU population were affected by poverty or social exclusion in 2015, the levels of individual countries varied widely. The country with the lowest share of poor or socially excluded people among its population was the Czech Republic (14.0 %), followed by Sweden (16.0 %), the Netherlands (16.4 %) and Finland (16.8 %). At the other extreme were some southern and eastern European countries, in particular Bulgaria (41.3 %), Romania (37.4 %) and Greece (35.7 %), where more than a third of the population was affected by poverty or social exclusion.

To meet the overall EU target on risk of poverty and social exclusion, Member States have set their own national targets in their National Reform Programmes. As noted in the European Council conclusions from 17 June 2010 ([12]), Member States are free to set their own targets based on the most appropriate indicators for their circumstances and priorities. In most countries the target is expressed as an absolute number of people to be lifted out of the risk of poverty or social exclusion compared with 2008 ([13]). This corresponds to the base year also used for the overall EU target.

In 16 Member States, the number of people at risk of poverty or social exclusion has risen since 2008, pushing them further away from their national targets (see Figure 5.4). Nineteen Member States use a target based on the indicator 'people at risk of poverty or social exclusion', and four (Bulgaria, Denmark, Estonia and Latvia) base their targets on

([10]) Equivalised disposable income refers to the financial means a household has left for saving and spending. It is calculated by taking a household's income and dividing it by the weighted household size, where each household member receives a weight based on their age.
([11]) European Anti-Poverty Network, *Poverty and inequality in the EU*, EAPN Explainer, 2014, p.17.
([12]) European Council, Conclusion from 17 June 2010, 2010.
([13]) European Commission, *Social Europe — Aiming for inclusive growth. Annual report of the Social Protection Committee on the social situation in the European Union (2014)*, Publications Office of the European Union, Luxembourg, 2015 (p. 162–461).

Figure 5.4: People at risk of poverty or social exclusion, by country, 2008 and 2015
(% of population)



(1) 2010 data (instead of 2008).
(2) Break in time series in 2011.
(3) Break in time series in 2012.
(4) Break in time series in 2014.
(5) 2014 data (instead of 2015).
(6) 2013 data (instead of 2015); break in time series in 2013.

Source: Eurostat (online data code: t2020_50)

one or more of its sub-indicators. The remaining countries (Germany, Ireland, the Netherlands, Sweden and the United Kingdom) define their targets based on nationally developed indicators not available on the Eurostat database ([14]).

Three countries using the 'at risk of poverty or social exclusion' indicator or one of its sub-indicators (the Czech Republic, Poland and Romania) had already reached their national poverty targets by 2015. Poland and Romania have also made the most progress in integrating their most vulnerable members into society with a reduction of 7.1 and 6.8 percentage points in the share of people affected by poverty or social exclusion, respectively. However, Romania still has one of the highest rates of people in poverty or social exclusion in the EU. Lithuania had also met its goal in 2014, but by 2015 it had moved away from it again. The other Member States using this concept to define their national targets have yet to meet their goals.

Improvements in the number of poor or socially excluded people between 2008 and 2015 can also be seen among other Member States who have either not reached their target (such as France, Croatia, Latvia, Austria, Slovakia and Finland) or have based their targets on country-specific indicators (such as Germany).

Three southern European countries — Greece, Cyprus and Spain — experienced the most substantial increases in the share of people at risk of poverty or social exclusion, ranging from five to eight percentage points.

One reason for the disparity in poverty rates across the EU is the uneven impact of the economic crisis. Although many factors have influenced overall economic performance, much of the current divergence results from the way labour

([14]) Germany and Sweden use targets based on different forms of unemployment, Ireland defined a combined poverty target, the Netherlands aims to reduce the amount of jobless households, Sweden's target refers to different situations of long-term unemployment, and the United Kingdom based its numerical targets on a nationally launched Child Poverty Act.

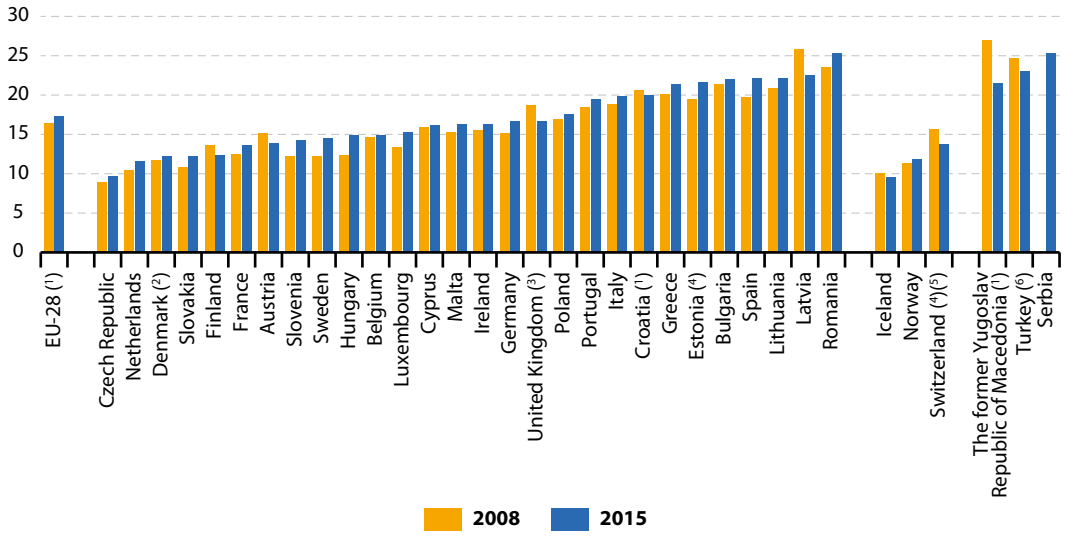
markets and social systems reacted to the severe global downturn and to fiscal consolidation packages implemented in most Member States ([15]); see also the chapter on 'Employment', page 25). Differences were further due to the effectiveness of the Member States' existing social policies and the extent of their efforts to adapt these according to contemporary challenges (for more information, see the European Commission's Annual Growth Survey 2017 ([16]) and its Joint Employment Report 2017 ([17]).

In 2015, 17.3 % of the EU population earned less than 60 % of their respective national median equivalised disposable income, the so-called poverty threshold. This represents a slight increase compared with 2008, when 16.5 % fell below this threshold.

Most countries also experienced growth in the number of people below the monetary poverty line, regardless of whether they had low or high levels to begin with. Increases were most pronounced in Hungary, Sweden and Spain, with rises of between 2.3 and 2.5 percentage points. Croatia, Finland, Austria, the United Kingdom and Latvia were the exception, with monetary poverty in these countries decreasing by 0.6 to 3.4 percentage points between 2008 (Croatia: 2010) and 2015 (see Figure 5.5).

Compared with the main economies worldwide, the EU average share of people suffering from monetary poverty at 17.3 % is low, despite increases since 2008. In most non-EU OECD countries, this value is roughly between 20 % and 25 % (see Figure 5.6). Commonwealth countries in the OECD outside the EU as well as Asian OECD countries including Russia are at the bottom end of this range, with 19.1 % in New Zealand, 20.1 % in Canada and 20.5 % in Australia as well as 19.8 % in South Korea, 21.9 % in Japan and 21.6 % in Russia.

Figure 5.5: People at risk of poverty after social transfers, by country, 2008 and 2015
(% of population)

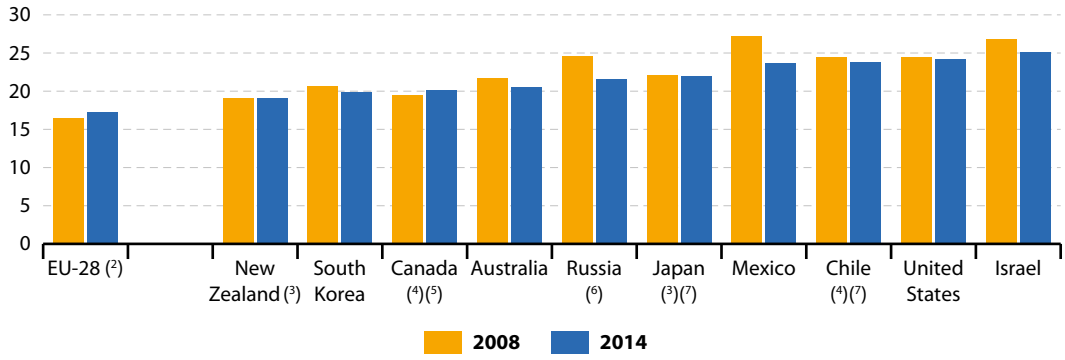


(1) 2010 data (instead of 2008).
(2) Break in time series in 2011.
(3) Break in time series in 2012.
(4) Break in time series in 2014.
(5) 2014 data (instead of 2015).
(6) 2013 data (instead of 2015).

Source : Eurostat (online data code: t2020_52)

(15) European Commission, *Social Europe — Aiming for inclusive growth. Annual report of the Social Protection Committee on the social situation in the European Union (2014)*, Publications Office of the European Union, Luxembourg, 2015 (p. 9).
(16) European Commission, Annual Growth Survey 2017, 2016.
(17) European Commission, Joint Employment Report 2017, 2017.

Figure 5.6: Poverty rate after taxes and transfers, poverty line 60 %, by country, 2008 and 2014 ([1])
(%)



([1]) Change in methodology for all countries except for EU-28: New income definition since 2012.
([2]) 2010 data instead of 2008.
([3]) 2012 data instead of 2014.
([4]) 2013 data instead of 2014.
([5]) 2008 data refer to new income definition since 2012.
([6]) 2010 data instead of 2014.
([7]) 2009 data instead of 2008; 2009 data refer to new income definition since 2012.

Source: OECD dataset on Income Distribution and Poverty

Monetary poverty is more prevalent in the Latin American OECD countries Chile (23.8 %) and Mexico (23.7 %) as well as the Unites States (24.2 %), Turkey (24.7 %) and Israel (25.1 %). Conversely, the EFTA States and OECD Members Norway (13.7 %) and Switzerland (14.6 %) have poverty rates lower than the EU average but higher than the EU Member States with the lowest shares ([18]).

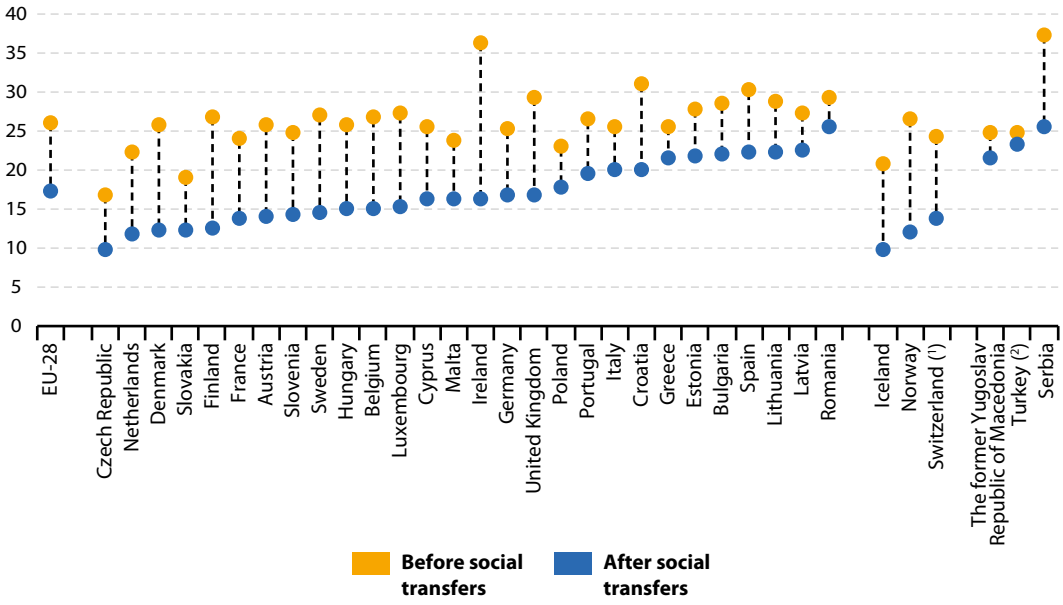
To reduce the risk of poverty or social exclusion within their populations, governments provide social security in the form of social transfers, such as pensions and unemployment benefits, among others. The effectiveness of monetary social provision can be evaluated by comparing the at-risk-of-poverty rate before and after social transfers (see Figure 5.7). In the EU, social transfers reduced the share of people at risk of poverty by 8.7 percentage points in 2015, from 26.0 % to 17.3 %. However, the extent to which Member States were able to reduce this rate through social transfers varied greatly. For example, the share of poverty before social transfers was similar in Finland (at 26.8 %) and in Romania (29.3 %). While Finland experienced the second largest decrease in the EU after social transfers (14.4 percentage points), in Romania the share of monetary poor only fell by a small extent (3.9 percentage points) as a result of such transfers.

Over time, the at-risk-of-poverty rates before and after social transfers have moved in different directions. The rate before social transfers was relatively stable in the EU between 2010 and 2015, while the rate after social transfers increased slightly over the same time. This could mean that either the amounts of social transfers paid have fallen or they have become less effective over time.

According to the European Semester Thematic Factsheet ([19]), differences in the effectiveness and efficiency of social protection expenditures depend on different factors, such as the level of poverty and inequality before social transfers and differences in the size and design of these expenditures ([20]).

([18]) These values are taken from the OECD dataset on Income Distribution and Poverty and correspond to the newest data available in this set (2014: Australia, Israel, South Korea, Mexico and the United States, 2013: Canada, Chile, Norway and Switzerland, 2012: Japan and New Zealand, 2010: Russia). All data except for that of Russia is based on the OECD's new income definition, which includes the value of goods produced for own consumption as a component of self-employed income, an element not considered in the SILC income definition.
([19]) European Commission, *European Semester Thematic Factsheet. Poverty and Social Exclusion*.
([20]) Earnings-related social benefits, for instance in old age, are often not aimed at reducing poverty as maintaining the living standards of those facing the risk.

Figure 5.7: At-risk-of-poverty rate before and after social transfers, by country, 2015
(%)



(1) 2014 data (instead of 2015).
(2) 2013 data (instead of 2015).

Source: Eurostat (online data codes: t2020_52 and tesov250)

Material deprivation covers issues relating to economic strain, durables and housing, and environment of the dwellings. People living in severely materially deprived conditions are greatly constrained by a lack of resources. This means they live in households unable to afford four or more items out of a list of nine considered by most people to be desirable or even necessary for an adequate life ([21]).

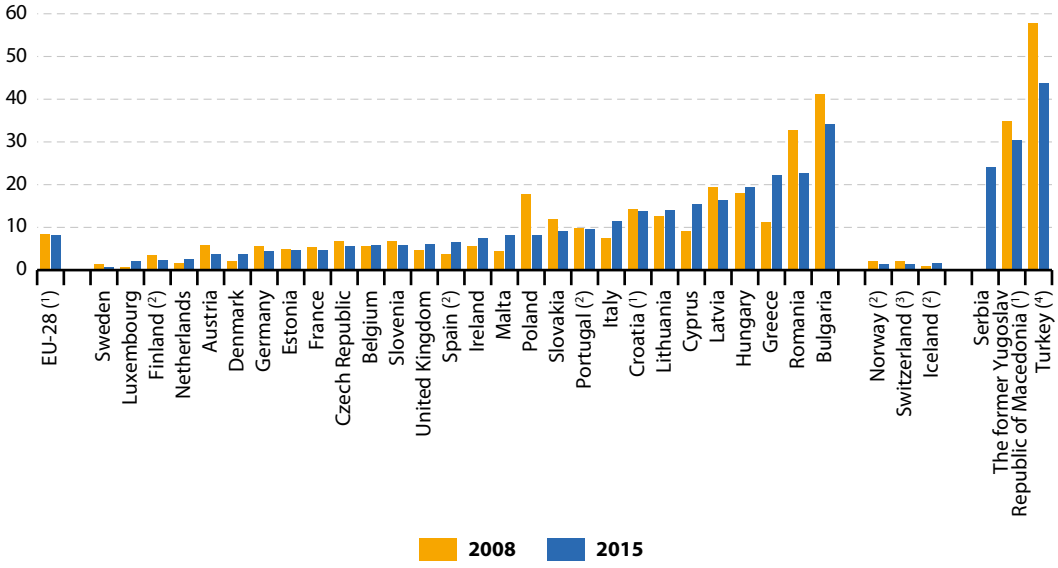
In 2015, 40.3 million people in the EU were living in conditions severely constrained by a lack of resources. This was equal to 8.1 % of the total EU population, making severe material deprivation the second most common form of poverty. Provisional estimates point towards a further reduction to 39.0 million people in 2016. The levels of severe material deprivation differed widely across the EU in 2015, from 34.2 % in Bulgaria to as low as 0.7 % in Sweden (see Figure 5.8).

These persistent disparities between Member States are likely to be due to a mix of factors. According to the Annual Report of the Social Protection Committee ([22]), differences in living standards and the effectiveness of social policies especially all play a part.

Since 2008, the number of people living in severe material deprivation has fallen in just over half of the Member States. Overall, in the EU this rate decreased from 8.4 % (2010 data) by 0.3 percentage points to 8.1 % in 2015. The most distinct improvements in this time period took place in Romania, Poland and Bulgaria, where severe material deprivation decreased by between 7 and 10 percentage points. As shown above, the decrease in severe material deprivation is the driver behind the decrease in the headline indicator measuring the share of people at risk of poverty or social exclusion. Thus to a large extent the overall

([21]) The nine items are: to pay their rent, mortgage or utility bills; to keep their home adequately warm; to face unexpected expenses; to eat meat or proteins regularly; to go on holiday; a television set; a washing machine; a car; a telephone.
([22]) European Commission, *Review of the social protection performance monitor and developments in social protection policies. Annual report of the social protection committee*, 2016.

Figure 5.8: Severely materially deprived people, by country, 2008 and 2015
(% of population)



(1) 2010 data (instead of 2008).
(2) 2015 data are provisional.
(3) 2014 data (instead of 2015).
(4) 2013 data (instead of 2015); break in time series in 2013

Source: Eurostat (online data code: t2020_53)

positive development in the headline indicator is due to the large decrease in material deprivation in Romania, Poland and Bulgaria.

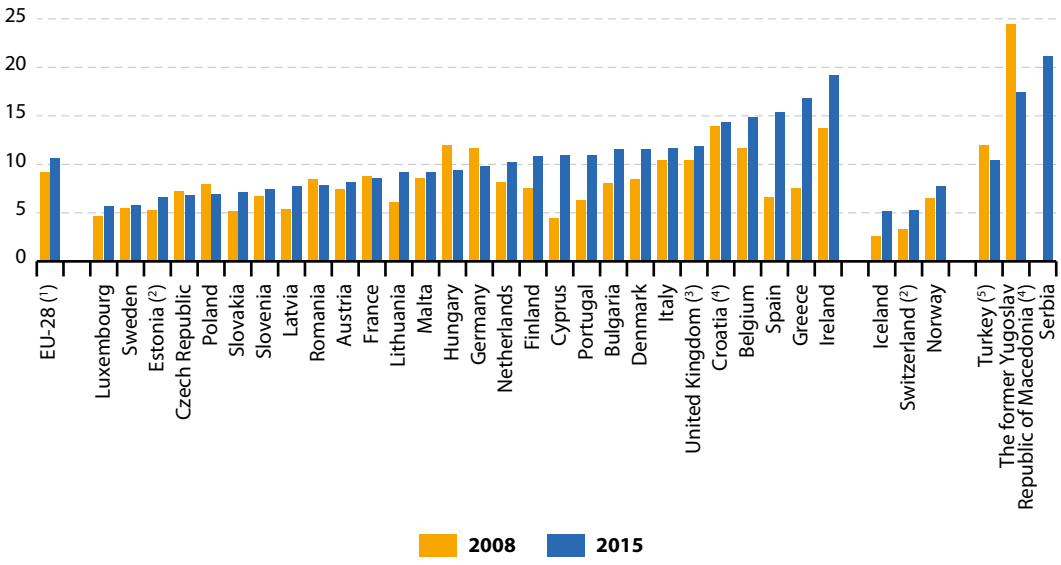
In a few Member States, the share of people living in poor conditions is much higher than the share at risk of monetary poverty. This shows that the structure of poverty is different across the Member States. For example, in Hungary and Bulgaria the proportion of people living in severely deprived conditions was about 1.5 times as high as the share living in monetary poverty. However, in a few countries with higher living standards, such as Spain, Sweden, Estonia and Luxembourg, the monetary poverty rate clearly exceeded the rate of people suffering from severe material deprivation.

In 2015, 10.6 % (or 39.6 million) of the EU population aged 0 to 59 were living in households with very low work intensity. This means the working-age members of the household worked no longer than 20 % of their potential working time during the previous year. Across Europe, this figure ranged from 5.7 % in Luxembourg to 19.2 % in Ireland (see Figure 5.9).

Even though on average the share of the population aged 0 to 59 who were living in households with very low work intensity was only 1.4 percentage points higher in 2015 than it was in 2008, the share has changed considerably in some individual Member States. Hungary, Germany and Poland showed substantial improvements in the work intensity of the working age population, with reductions in the share of people living in households with very low work intensity ranging between 2.6 and 1.1 percentage points. The opposite was true in the southern European countries Greece, Spain, Cyprus and Portugal, as well as Ireland, where the shares increased between 4.6 and 9.3 percentage points.

In some countries, low work intensity levels do not seem to correspond to the extent of the other forms of poverty or social exclusion.

Figure 5.9: People living in households with very low work intensity, by country, 2008 and 2015
(% of population aged 0 to 59)



(1) 2008 data refer to EU-27 (instead of EU-28).
(2) Break in time series in 2014.
(3) Break in time series in 2012.
(4) 2010 data (instead of 2008).
(5) 2013 data (instead of 2015).

Source: Eurostat (online data code: t2020_51)

Belgium, the United Kingdom and Denmark, for example, had a higher-than-average proportion of population aged 0 to 59 living in households with very low work intensity (14.9 %, 11.9 % and 11.6 %, respectively), despite their risk of monetary poverty and severe material deprivation being below the EU average. In contrast, Latvia and Romania were among the Member States with the highest proportion of their population at risk of monetary poverty in 2015 while having some of the lowest shares of households with very low work intensity (7.8 % and 7.9 %, respectively) ([23]).

Poverty and social exclusion do not only affect those who are economically inactive or unemployed (for more information on employment statistics indicators see the chapter on 'Employment', page 25). In 2015, 7.7 % of the working EU population were at risk of poverty despite working full time (the so-called working poor). The share of the working population at risk of poverty again varied greatly among Member States, ranging from 2.9 % in Finland to 14.7 % in Romania ([24]).

With the exception of those aged 18 to 24, men are more often among the working poor than women. This is because women are more often secondary earners, meaning the household income does not depend solely on them, and working poverty is determined by household income ([25]).

([23]) This can be the case for a number of reasons, such as a high amount of social transfers in one country or a generally low income level in another.
([24]) Source: Eurostat (online data code: ilc_iw07).
([25]) For more information, see European Parliament, *In-work Poverty in the EU*, accessed [19 June 2017].

5.3 Which groups are at greater risk of poverty or social exclusion?

Despite a reduction in the poverty gender gap since 2012, the share of women suffering from poverty or social exclusion was still 1.4 percentage points higher than the corresponding share of men in 2015.

31.3 % of young people aged 18 to 24 and 26.9 % of those aged less than 18 were at risk of poverty or social exclusion in 2015. At 17.4 %, this rate was considerably lower among the elderly aged 65 or over.

Of all groups examined based on their employment status, the unemployed faced the greatest risk of poverty or social exclusion, at 66.6 % in 2015.

Almost 50 % of all single parents were at risk of poverty or social inclusion in 2015. This was double the average and higher than for any other household type analysed.

34.7 % of adults with at most lower secondary educational attainment were at risk of poverty or social exclusion in 2015. The situation is especially dire for children of parents with at most pre-primary and lower secondary education — of these, 65.6 % were at risk.

In 2015, 40.2 % of adults born in a country outside the EU and 25.2 % of those born in a different EU country than the reporting one were at risk of poverty or social exclusion. In comparison, for native citizens, only 21.7 % of the population were at risk.

EU citizens in rural areas were on average slightly more likely to live in poverty or social exclusion than those living in urban areas (25.5 % compared with 24.0 %) in 2015. However, there is no consistent pattern across all Member States.

Identifying groups with a heightened risk of poverty or social exclusion and determining the reasons behind this vulnerability is the key to creating sound policies to fight poverty. Compared with the EU average, some groups of the population are at a higher risk of poverty or social exclusion. The most affected are women, children, young people, the unemployed, single-parent households and those living alone, people with lower educational attainment, people born in a different country than the one they reside in, people out of work, and in a majority of Member States those living in rural areas.

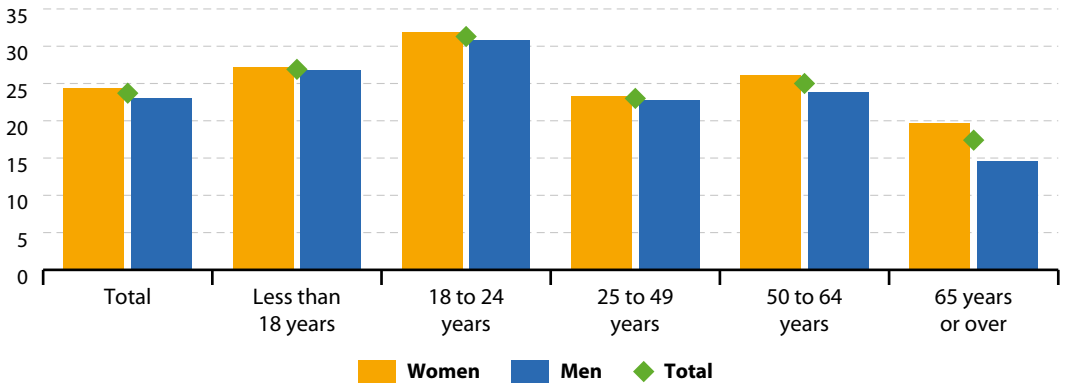
5.3.1 Women and young people are more likely to live in poverty and social exclusion than men

People's roles and responsibilities within families and at the workplace change throughout their lives and can also be influenced by gender. Thus, age and sex are an interesting breakdown to consider when analysing poverty or social exclusion (see Figure 5.10).

In 2015, women were more likely to experience poverty or social exclusion than men by 1.4 percentage points (the rate for women was 24.4 %, while for men it was 23.0 %). Women were worse off in all EU countries except for Poland and Spain, where men were at higher risk of poverty or social exclusion, and Finland, where the risk was equal for men and for women. In 2015, the gender gaps were highest in the Baltic States Latvia (5.5 percentage points) and Estonia (3.8 percentage points) as well as in Bulgaria (3.5 percentage points), the Czech Republic and Slovenia (3.3 percentage points each).

Overall, between 2008 and 2015 the share of both men and women at risk of poverty or

Figure 5.10: People at risk of poverty or social exclusion, by sex and age group, EU-28, 2015
(% of population)



Source: Eurostat (online data code: ilc_peps01)

social exclusion followed a similar path to the headline indicator depicted in Figure 5.1. After 2012, however, the rate decreased more for women than it did for men, slightly reducing the difference between the genders. The gender gap narrowed in almost all EU countries between 2008 and 2015, except for Sweden, Latvia and Bulgaria, where minor increases were observed.

Because the structure of the survey assumes that households with more than one member share their resources equally, the main drivers behind the gender gap are higher poverty rates among single female households, mainly those with dependent children ([26]). In a workshop on the main causes of female poverty ([27]), the Directorate General for Internal Policies pointed out that one reason for this persisting gender gap is that single parents are more likely to have very low work intensities compared with other households with children. Single-parent households tend to be far more often headed by women. In 2011, 11.6 % of the EU population reported having lived in a single-parent household at the age of 14. Almost 10 % of the respondents lived with their mother only, while 1.8 % lived with their father ([28]). A comparison of Member States' performance in the European Semester Thematic Factsheet ([29]) shows two policy measures that could ease this problem: child and family-support benefits and access to affordable, high-quality childcare.

The long-term effects of reduced work intensity among women (both single and married) become especially apparent in old age. Although women were more likely to be at risk of poverty or social exclusion than men in all age groups in 2015, the largest differences could be seen in the oldest group (65 or over), displaying a gender gap of 5 percentage points. One explanation for the gender poverty gap among elderly EU citizens is that on average women receive a lower pension income than men. As shown in the European Commission's Pension Adequacy Report ([30]), this is mainly due to childcare-related gaps in their employment history and patterns of employment with low pension coverage.

For both men and women, young people aged 18 to 24 are the most likely to be at risk of poverty or social exclusion. Almost a third of young people were at risk in 2015 (31.8 % of women and

([26]) Given that the data does not reveal systematic differences in the risk of poverty or social exclusion between single female and single male households without dependent children, the gender gap is expected to be caused by single households with dependent children.
([27]) Directorate-General for Internal Policies, *Workshop on main causes of female poverty*, 2015, (p. 22).
([28]) Eurostat, *Living condition statistics — family situation of today's adults as children*, accessed [19 June 2017].
([29]) European Commission, *European Semester Thematic Factsheet. Social Inclusion*, 2016 (p. 7, 8).
([30]) European Commission, *The 2015 Pension Adequacy Report: current and future income adequacy in old age in the EU*, Volume 1, 2015.

30.8 % of men). People younger than 18 years had the second highest risk, at 26.9 %. Moreover, the situation of young people aged 18 to 24 has deteriorated the most since 2010 compared to other age groups. Although their risk of poverty or social exclusion had been falling until 2009, it climbed back up in the following years. However, there was a slight reduction in 2015 compared to 2014 (for more information on this group's employment situation see the chapter on 'Employment', page 25). In contrast, older people aged 65 or over had the lowest rate of poverty or social exclusion, at 17.4 % in 2015 ([31]). Rates for this group showed a steady decline between 2010 and 2014. As a result, the age gap widened during this period and has remained stable after that.

This widening of the poverty gap between young people aged 18 to 24 and older people aged 65 or over can be seen in more than half the Member States. Especially large increases could be observed in the southern European countries Greece, Spain, Cyprus and Portugal (see the chapter on 'Employment', page 25) ([32]). This is to a large extent because in most countries during the preceding economic crisis, pensions and retirement benefits for older people were either not reduced or not reduced by as much as was the income of the younger population ([33]).

5.3.2 Lack of work increases the risk of poverty or social exclusion

At 66.6 %, exactly two-thirds of unemployed people in the EU were at risk of poverty or social exclusion in 2015 ([34]). In the same year, 43.7 % of other economically inactive people ([35]) were also at risk. In comparison, the share of employed people at risk was just 12.5 %. This shows that poverty or social exclusion are more likely to affect unemployed people. And the extent to which members of a household have the opportunity to work will also affect their risk of poverty or social exclusion. (For more information on this topic see the sub-indicator very low work intensity earlier in this chapter.)

However, the risk of poverty or social exclusion increased for all groups regardless of their employment status between 2010 and 2015, except for retired people, where it fell by 2.8 percentage points. Of the Member States in 2015, Luxembourg had the lowest risk of poverty or social exclusion among the unemployed (53.3 %), while Germany had the highest (83.1 %).

Interestingly, men were more likely than women to experience poverty across all employment statuses, except for retirees. Among those, the share of women at risk of poverty or social exclusion was 3.3 percentage points higher than that of men. This shows that one of the drivers behind the feminisation of poverty and social exclusion discussed earlier is the amount of women at risk of poverty or social exclusion at retirement age.

5.3.3 Single parents face the highest risk of poverty or social exclusion

Single people with one or more dependent children had a 47.9 % chance of being at risk of poverty or social exclusion in 2015. This was just over twice the average rate and higher than for other household types. However, this group also experienced the largest decline in the percentage at risk since 2010 when the rate was 52.1 % and well over double the average.

Figure 5.11 shows that in general households with only one adult — both with children and without — and households with many children are at a higher risk of poverty or social exclusion. In single-adult households there is no partner to help cushion temporary disruptions such as unemployment or sickness. Also, many such households are made up of young unemployed

([31]) Reasons for this could include that many elderly people receive regular pensions, have accrued some wealth and have often paid off their mortgage.
([32]) Estonia, Croatia, Latvia, Slovenia and Malta were in the opposite situation where poverty was higher among the older than the younger age groups in 2015.
([33]) Bertelsmann Stiftung, *Social Justice in the EU — Index Report 2015. Social Inclusion Monitor Europe*, 2015 (p.10).
([34]) Eurostat (online data code: ilc_peps02).
([35]) The main economically inactive groups are students, people looking after family and home, long-term sick and disabled, temporarily sick and disabled, retired people and discouraged workers (UK Office for National Statistics, *A guide to labour market statistics*, 2012).

people or pensioners — often women — which have a higher-than-average risk of poverty or social exclusion ([36]). Single parents also face the challenge of being both the primary breadwinner and caregiver for the family. The group with the lowest poverty rate in 2015 was that of households with two adults where at least one person was aged 65 years or over.

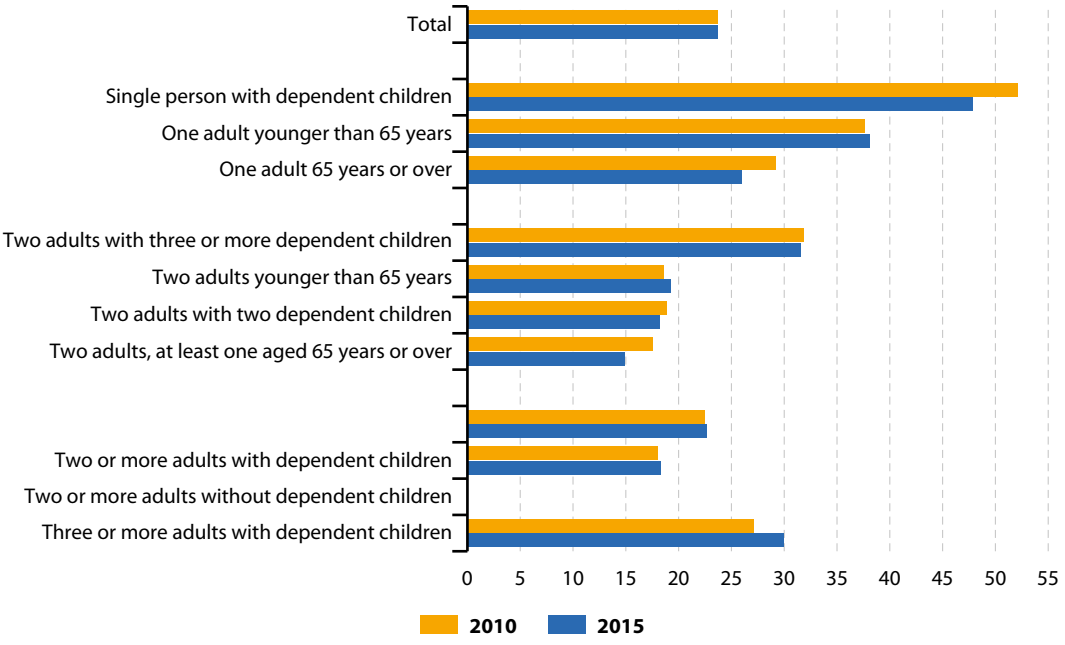
At the Member State level, the at-risk of poverty or social exclusion rate for single parent households showed varying trends between 2010 and 2015. Changes ranged from a rise of 7.4 percentage points in Greece to a fall of 17.9 percentage points in Malta. Other countries also experiencing large increases were Denmark (6.9 percentage points) and Finland (6.7 percentage points). The biggest falls, besides Malta, were in Latvia (– 13.7 percentage points) and Germany (– 10.4 percentage points).

In contrast, for households with two adults with at least one aged 65 or over, the at-risk-of-poverty or social-exclusion rate decreased, or increased only slightly, in a majority of Member States. Hence, the absence of children seems to lower the risk of poverty or social exclusion.

5.3.4 People with low educational attainment are three times more likely to be at risk compared with those with the highest degrees

In 2015, 34.7 % of people with at most lower secondary educational attainment were at risk of poverty or social exclusion (see Figure 5.12). In comparison, only 11.7 % with tertiary education were in the same situation. This shows that the least educated people were almost three times more likely to be at risk than those with the highest education levels (also see the chapter on 'Education', page 107). This is also reflected

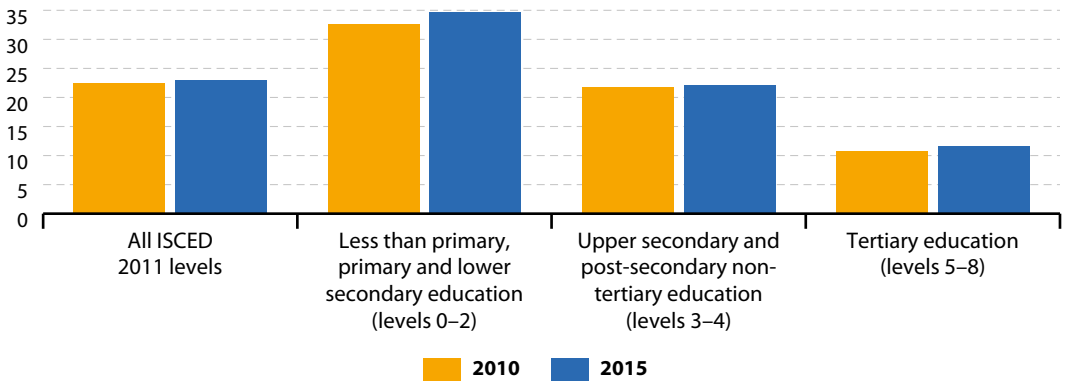
Figure 5.11: People at risk of poverty or social exclusion, by household type, EU-28, 2010 and 2015
(% of population)



Source: Eurostat (online data code: ilc_peps03)

([36]) European Centre for Social Welfare and Policy Research, *Poverty Across Europe: The latest evidence using the EU-SILC Survey*, 2008.

Figure 5.12: People at risk of poverty or social exclusion, by educational attainment level, EU-28, 2010 and 2015
(% of population aged 18 and over)



Source: Eurostat (online data code: ilc_peps04)

in the data on employment which shows that the likelihood of being employed rises in line with educational level (see the chapter on 'Employment', page 25, or the Education and Training Monitor 2016 of the European Commission ([37]) for more information).

This situation is even more distinct in Member States such as Croatia, Hungary, Poland, Slovenia, Romania, Malta and the Czech Republic. In these countries, people with the lowest educational attainment were over four to more than seven times more likely to be at risk of poverty or social exclusion than those with the highest educational attainment. In 13 Member States, this ratio increased between 2010 and 2015. However, a better education did not necessarily offer protection from the crisis. Between 2010 and 2015, 14 Member States also experienced a rise in the rate among those with the highest educational degrees.

5.3.5 The risk of poverty or social exclusion due to low education is passed on to the next generation

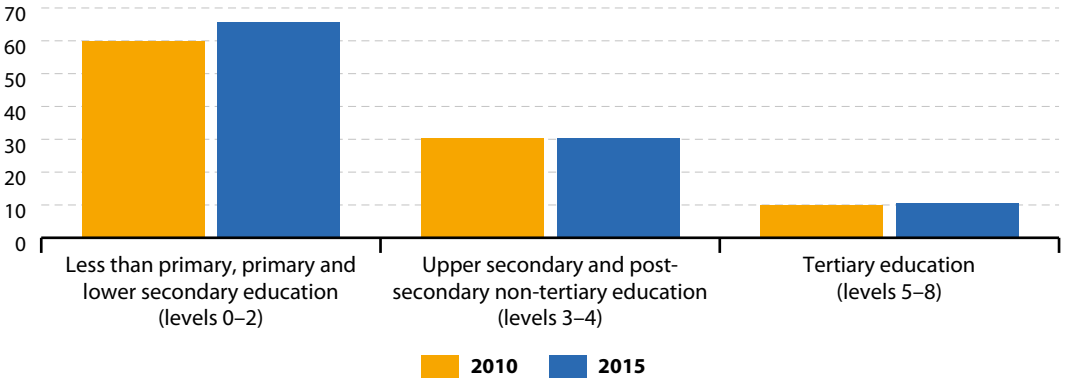
An important aspect to consider when analysing the overall number of people living in poverty or social exclusion is how factors leading to these situations are transmitted from one generation to the next.

In 2015, 65.6 % of children of parents with at most pre-primary and lower secondary education were at risk of poverty or social exclusion. This was over six times higher than for children of parents with first or second stage tertiary education. Moreover, between 2010 and 2015 the increase in the risk of poverty or social exclusion was particularly high for children of parents with the lowest educational attainment while the increase was minimal for the other children. Thus, education, which is a strong determinant of poverty or social exclusion for adults, also influences whether children live in poverty or social exclusion.

In 2015, children whose parents had the lowest educational attainment had the highest risk of poverty or social exclusion in Slovakia (94.4 %), Bulgaria (89.5 %) and Hungary (83.7 %). Furthermore, while the Czech Republic has the overall lowest rate of poor or socially excluded people in all of the EU, children in the Czech Republic born to parents with the lowest educational attainment were highly likely to suffer from poverty or social exclusion (at a rate of

([37]) European Commission, *Education and Training Monitor 2016*, 2016 (p. 27).

Figure 5.13: Children at risk of poverty or social exclusion by educational attainment level of their parents, EU-28, 2010 and 2015
(% of population aged less than 18 years)



(1) 2015 data are estimates.

Source: Eurostat (online data code: ilc_peps60)

82.3 %). Conversely, in Denmark, Portugal, Estonia and Luxembourg the risk of poverty or social exclusion for children whose parents had the lowest educational attainment was the lowest in the EU, between 41.9 % and 49.9 % (for more information on the educational levels per country, see the chapter on 'Education', page 107).

The risk of poverty or social exclusion for children whose parents had the lowest educational attainment increased between 2010 and 2015 in over two thirds of Member States. The increase ranged from 19.8 percentage points in Lithuania to 0.4 percentage points in Slovakia. In ten of these Member States, such an increase took place although the overall rate of poverty or social exclusion decreased. For instance, in Lithuania the overall poverty rate fell by 4.7 percentage points. A third of the Member States made progress on this issue. For instance, in Estonia, Poland and Romania this rate decreased by 10 percentage points or more. With the exception of the United Kingdom, the overall poverty rate also fell in these countries.

The socio-economic environment in which children grow up does not only affect the standard of living in their youth. There is also a close link between the socio-economic status of adults and the status of their parents during their childhood (see Figure 5.13).

For instance, the ad hoc module on Intergenerational transmission of disadvantage statistics (38) carried out in the EU Statistics on Income and Living Conditions (SILC) in 2011 showed that 34.2 % of low-educated adults also had low-educated parents in their childhood. This can be explained by the parents' inability to financially support their children's studies and/or to pass on a perception of the importance of education to their children.

Education is not the only factor transmitted from generation to generation. In 2011, 68.9 % of adults with a low ability to make ends meet grew up in a household in the same situation. Moreover, among adults 'not at work', 28.6 % also grew up in a household with at least one parent 'not at work' (39). Thus, children growing up in unfavourable conditions are less likely than their better-off peers to do well in school, enjoy good health and realise their full potential later in life (for

(38) Eurostat, *Intergenerational transmission of disadvantage statistics*, accessed [19 June 2017]
(39) Parents 'not at work' include those who were unemployed, in retirement or in early retirement or had given up business, fulfilling domestic tasks and care responsibilities, other inactive person, and those answering 'don't know'.

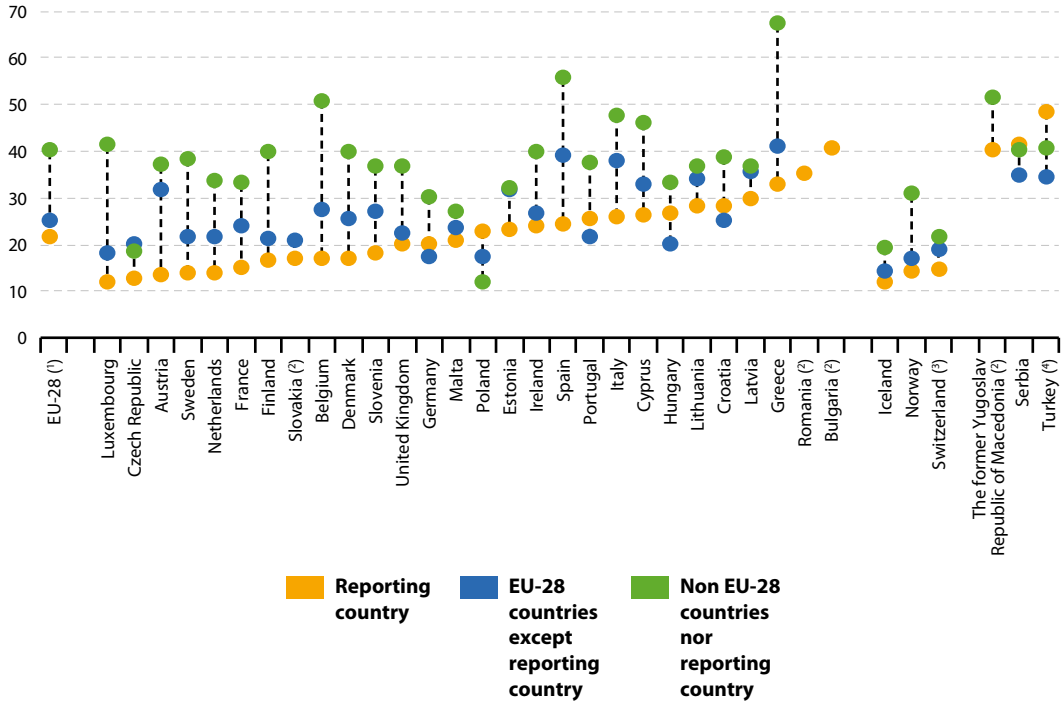
more information see Eurostat's statistical book on Living Conditions in Europe ([40]).

In a Commission Recommendation ([41]), the European Commission encouraged Member States to take action to prevent disadvantages being transferred from one generation to another. Specifically, it advised them to guarantee that children grow up with enough resources, as well as assuring their access to quality education including childcare services and health services, and to enforce children's rights to access different pastime activities.

5.3.6 People from outside the EU are generally worse off than people living in their home country

In 2015, people living in the EU but born in a non-EU country had a 40.2 % risk of living in poverty or social exclusion. The risk was lower for people born in an EU-country other than the one they were living in, at 25.2 %. Among the people whose country of residence corresponded to their country of birth, 21.7 % were at risk of poverty or social exclusion. Thus, people born outside the EU were almost twice as likely to be at risk of poverty or social exclusion compared with native citizens.

Figure 5.14: People at risk of poverty or social exclusion by broad group of country of birth, by country, 2015
(% of population aged 18 and over)



(1) Estimated data for foreign country.
(2) Missing data due to low reliability.
(3) 2014 data.
(4) 2013 data.

Source: Eurostat (online data code: ilc_peps06)

([40]) Eurostat, *Living conditions in Europe. Eurostat statistical books*, 2014 (p. 101).
([41]) European Commission, Commission Recommendation of 20 February 2013, *Investing in children: breaking the cycle of disadvantage*, Official Journal of the European Union, 2013.

Compared to migration from a country from outside the EU, migration within the EU bears a far smaller risk of poverty or social exclusion.

A cross-country comparison shows that this 'origin gap' differs strongly across EU Member States. The countries with the greatest difference in at-risk-of-poverty rate between people from non-EU countries and those living in their home country are Greece (34.3 percentage point gap), Belgium (33.7 percentage point gap) and Spain (31.3 percentage point gap). Conversely, the Czech Republic and Malta showed the smallest differences between these two groups. In these countries, foreign citizens from a non-EU country were around six percentage points more likely to be at risk of poverty or social exclusion compared with citizens living in their country of birth. In Poland the opposite pattern could be seen, where people from non-EU countries had a 10.7 percentage point lower risk of poverty or social exclusion compared with native citizens in 2015. Finally, in some Member States foreign citizens from other EU countries fare better in terms of poverty or social exclusion than native citizens. This is the case in Hungary, Poland, Portugal, Croatia and Germany.

Country differences in the 'poverty origin gap' could be explained by a number of factors, such as the level of education, labour market access and employment status of foreign citizens residing in a given Member State. Difficulties in labour market access among foreign citizens can be due to migration-specific work obstacles: problems with credential recognition, language and communication barriers, or discrimination on social and religious grounds (for more information, see the Eurostat Article on First and second-generation immigrants — obstacles to work ([42])). Furthermore, the socio-economic outcomes of the foreign-born population in Member States may also reflect the different reasons for migrating to a specific country. For instance, in many EU countries a large share of non-EU migrants did not come to their host country primarily for work, but rather for family reasons, or, in some Member States, for international protection (see Employment and Social Development in Europe 2015 ([43])).

Between 2010 and 2015 the risk of poverty or social exclusion increased for those living in a country other than their country of origin, both for those from outside the EU (by 3.3 percentage points) and those from inside the EU (by 2.7 percentage points).

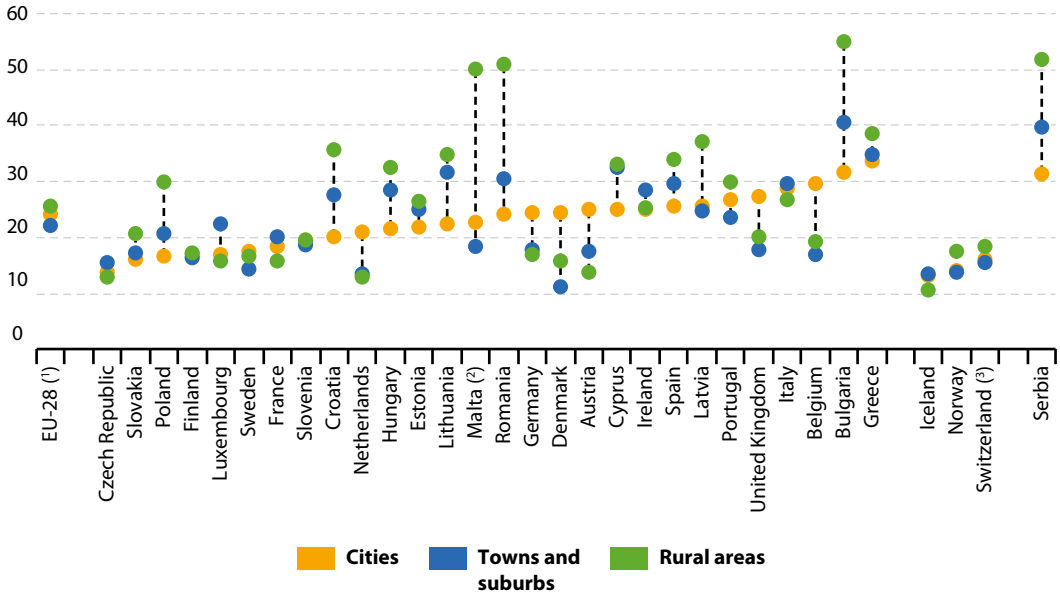
The overall trend could be explained by the fact that migrants from non-EU countries have suffered the most from rising unemployment in the EU, as shown in the Migrant integration statistics. The situation of the non-EU-born population in the EU is especially relevant in light of the integration challenge the EU has been facing due to the influx of asylum seekers that increased notably in 2015 (for more information see the Asylum quarterly report).

5.3.7 In the majority of Member States, people in rural areas are more at risk of poverty or social exclusion

On average, EU citizens in rural areas were slightly more likely to live at risk of poverty or social exclusion than those in urban areas (25.5 % in rural areas compared with 24.0 % in urban areas) in 2015 (see Figure 5.15). Those living in towns or suburbs were the least likely to be at risk (22.1 %). However, the figures vary greatly between Member States. In 15 Member States, people living in rural areas were at the highest risk of being poor or socially excluded. The countries with the highest poverty rates in rural areas compared with urban areas are Romania (26.7 percentage points higher) and Bulgaria (23.1 percentage points higher) ([44]). In other countries, such as Denmark, Austria, Belgium, the United Kingdom, the Netherlands

([42]) Eurostat, *First and second-generation immigrants — obstacles to work*, accessed [19 June 2017].
([43]) European Commission, *Employment and Social Development in Europe 2015*, 2016 (p. 14).
([44]) The same holds true for Malta, but the data is of low reliability.

Figure 5.15: People at risk of poverty or social exclusion by degree of urbanisation, by country, 2015
(% of population)



(1) Estimated data for rural areas.
(2) Data for 'rural areas' are of low reliability.
(3) 2014 data

Source: Eurostat (online data code: ilc_peps13)

and Germany, the opposite is true: a clearly larger share of urban residents live in poverty or social exclusion compared with residents in rural areas or towns. There are also countries, such as the Czech Republic, Finland and Slovenia, where the poverty rates in urban, rural or suburban areas differ only slightly.

In a study report on poverty and social exclusion in rural areas ([45]), the European Commission identified four main categories of problems that characterise rural areas in the EU and determine the risk of poverty or social exclusion: demography (for example, the exodus of residents and the ageing population in rural areas), remoteness (such as lack of infrastructure and basic services), education (for example, lack of preschools and difficulty in accessing primary and secondary schools) and labour markets (lower employment rates, persistent long-term unemployment and a greater number of seasonal workers). For more information on the different employment rates across different types of municipalities, see the chapter on 'Employment', page 25).

([45]) European Commission, *Poverty and social exclusion in rural areas. Final study report*, Luxembourg, Office for Official Publications of the European Communities, 2008.

5.4 Outlook towards 2020

Despite progress in reducing poverty or social exclusion levels, aided by the incipient economic recovery, the number of poor or socially excluded people still needs to fall by 22.9 million people in the EU by 2020 to fulfil the poverty goal of the Europe 2020 strategy.

In its stocktaking of the Europe 2020 strategy ([46]), the European Commission acknowledges there is no sign of a rapid improvement in the situation and expects that the number of people at risk of poverty might remain at about 100 million by 2020. The European Commission expresses a concern that 'the situation is particularly aggravated in certain Member States, reckoning that 'the crisis has demonstrated the need for effective social protection systems'.

In accordance with the principles of the EU 2020 strategy governance, common efforts are taken by EU institutions and Member States, fully respecting the subsidiarity principle in policy development, as reinforced by the European Pillar of Social Rights. The EU complements and supports the Member States' policies by policy guidance in various domains and Country Specific Recommendations within the European Semester. Furthermore, between 2014 and 2020, at least 20% of the European Social Fund is earmarked for measures combating poverty and social exclusion (for more information, see the information provided by the European platform against poverty and social exclusion).

In order to reach the objective of the Europe 2020 strategy of reducing the amount of people at risk of poverty or social exclusion by 20 million people, the Annual Report of the Social Protection Committee ([47]) emphasises there needs to be a shift from short-term measures to structural reforms. Appropriate economic, employment, tax and education policies could support economic growth, raise employment ([48]) and help tackle in-work poverty, and guarantee adequate levels of social protection and access to quality services.

As the most widespread form of poverty, monetary poverty is one of the major challenges to achieving the Europe 2020 target. The proportion of people at risk of monetary poverty is closely linked to income inequality. As stated in the Synthesis Report of the 2011 Peer Review in Social Protection and Social Inclusion, this is not reduced by simply raising the average income. Therefore, action needs to be taken in the areas of social protection and improving the efficiency and effectiveness of income support schemes. This is further emphasized by the Active Inclusion Recommendation calling on EU governments to establish an integrated strategy based on three social policy pillars, namely adequate income support, inclusive labour markets, and access to quality services.

To make progress towards the Europe 2020 poverty goal it will be particularly important to focus on groups that are at high risk of poverty or social exclusion. With the Social Investment Package, the European Commission has set forth an integrated policy framework aiming to reach out to various vulnerable target groups. It focuses on simplifying and better targeting social policies, ensuring that social protection systems respond to people's needs, and investing in people's skills and capacities. Within this policy framework, the European Commission put forward a specific Recommendation on Investing in children: breaking the cycle of disadvantage ([49]).

([46]) European Commission, *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth*, Brussels, 2014 (p.14).
([47]) European Commission, *Social Europe — Aiming for inclusive growth. Annual report of the Social Protection Committee on the social situation in the European Union (2014)*, Publications Office of the European Union, Luxembourg, 2015 (p. 9).
([48]) However, some research also shows that the positive employment development before the economic crisis did not strongly contribute to reducing poverty (see Taylor-Gooby, P., Gumy, J. and Otto, A. 2015, *Can 'New Welfare' address poverty through more and better jobs?*, Journal of Social Policy [Online] 44:83-104 and Cantillon, B., Luigjes, C. and Marchal, S. 2015, *Decent incomes for the poor: which role for Europe?*, Discussion Paper No. 15/18).
([49]) European Commission, *Investing in Children: breaking the cycle of disadvantage*, Commission Recommendation of 20 February 2013.

Specific actions to reduce poverty or social exclusion have been outlined in the Youth Guarantee Programme, a commitment by all Member States to ensure that all young people under the age of 25 receive employment opportunities or further education after having finished formal education. One of the main financial resources to support the implementation of national Youth Guarantee schemes is the Youth Employment Initiative. It has been established to directly support young people not in education, employment or training in regions with a youth unemployment rate above 25 %. Also, the Council Recommendation on the integration of the long-term unemployed into the labour market is working towards a simplified and better access to support for those out of work for long periods. Finally, the Fund for European Aid to the Most Deprived (FEAD) supports EU countries' actions in providing food, clothing and other essential goods to the most deprived and finance non-material social inclusion measures for the poorest in society.

Additionally, the EU agency Eurofond, which has been providing knowledge to assist in the development of social and work-related policies since 1975, supports the Europe 2020 strategy with research to identify factors for successful changes.

Country profiles

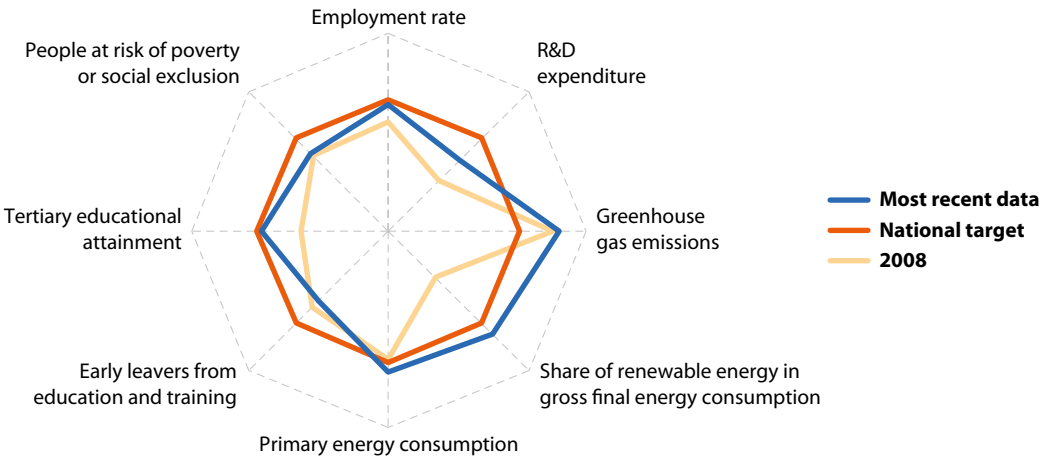
Country profiles

This section provides an overview of each Member State's situation in relation to the Europe 2020 headline indicators and national targets.

Member States define their national targets in their National Reform Programmes (NRPs), taking into consideration their current situation. These programmes outline the actions and measures they plan to undertake to meet their national targets. The European Commission assesses each NRP and provides country-specific recommendations to support the programmes. The full NRPs and country-specific recommendations can be downloaded from the European Commission's Europe 2020 website.

This chapter illustrates the current situation of each Member State with the help of radar charts. The charts show how far a country is from its national targets as a percentage of the targets by comparing the national target (red line), the country's situation in 2008 (yellow line) and the most recent situation (blue line). The distance between the blue line and the red line for a particular indicator shows how far a country currently is from its national target. Data points on or outside the red line mean the country has met or exceeded this target, while those inside show it still has some way to go. Comparing a country's most recent performance with the yellow line reveals whether it has moved closer towards or further away from its targets since 2008 ([1]). In the case of greenhouse gas emissions, some countries were allowed to increase their emissions compared to 1990 levels, although the EU-level target is a reduction of emissions. This is why for some countries, this target had already been reached in 2008, and therefore, the yellow line showing 2008 levels is outside the red target line.

National targets that are not harmonised with the overall EU targets are not presented in the diagram. For example, this is the case with the poverty and social exclusion targets adopted by some countries. Regarding the indicator on energy efficiency, Member States have set indicative national targets based on different indicators



([1]) Please note that in a few cases, some countries have changed their national targets since 2008, therefore comparisons with earlier editions of this publication may be misleading.

(primary or final energy consumption, or primary or final energy savings, or energy intensity) in line with the Energy Efficiency Directive. These have been translated into absolute levels of primary energy consumption, expressed in million tonnes of oil equivalent (Mtoe).

Progress towards the national greenhouse gas (GHG) emissions targets is analysed based on emissions in sectors not covered by the EU Emissions Trading Scheme (EU ETS) and in relation to the base year defined in the Effort Sharing Decision (ESD) ([2]). For further details on the EU ETS and the ESD see the chapter 'Climate change and energy' on page 81.

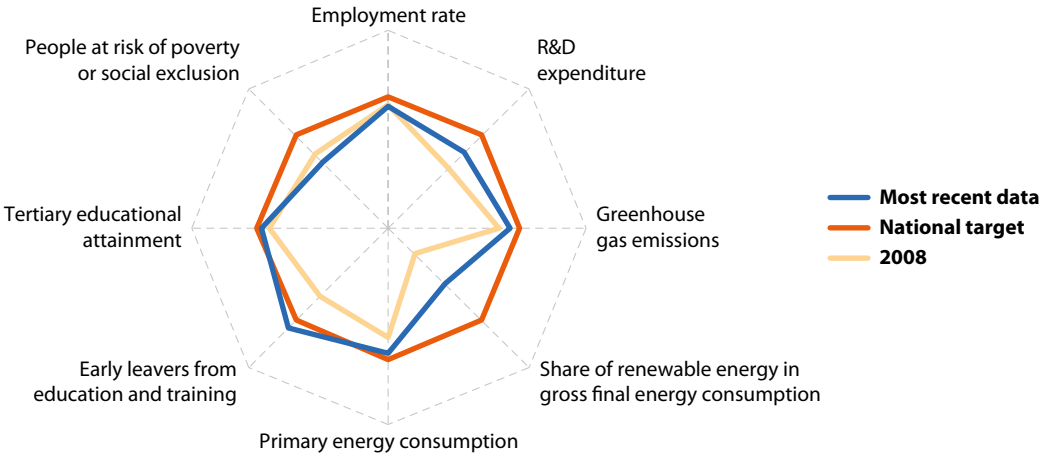
The national targets (as defined in the NRPs) and the latest available national data for the headline indicators are presented in a separate table. Data on Europe 2020 headline indicators, targets and related issues are disseminated by Eurostat on a dedicated section of its website.

([2]) The Effort Sharing Decision (406/2009/EC) originally defined 2005 as base year for Member States' GHG emissions reductions. However, due to recent recalculations with improved methodologies used at national level to measure the estimated emissions, 2005 values of countries are not necessarily equal to the value of the ESD base year.

Belgium

In 2016, Belgium surpassed its targets on early leavers from education and training by 0.7 percentage points. The country almost reached its energy efficiency target, which foresees a reduction in primary energy consumption to 43.7 Mtoe. The country has also increased its R&D expenditure as a share of GDP, but in 2015 it was still 0.6 percentage points from its 3 % national target. The share of renewable energy in gross final energy consumption more than doubled between 2008 and 2015, but the country remains five percentage points below its 13 % national target. Similarly, the 2.7 percentage point increase in the share of tertiary graduates since 2008 was not enough to reach the 47 % national target. Although the country reduced its GHG emissions in non-ETS sectors between 2008 and 2015, it is still 6.7 percentage points from its national target. Lack of progress on the employment rate between 2008 and 2016 means it is still 5.5 percentage points away from its target. Between 2008 and 2015, the number of people at risk of poverty or social exclusion increased by about 6 %, moving the country further from its 2020 target.

Figure 6.1: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.1: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	67.7	2016	73.2
Gross domestic expenditure on R&D (% of GDP)	2.45 (1)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 8.3 (1)	2015	– 15
Share of renewable energy in gross final energy consumption (%)	7.9	2015	13
Primary energy consumption (million tonnes of oil equivalent)	45.7	2015	43.7
Early leavers from education and training (% of population aged 18–24)	8.8	2016	9.5
Tertiary educational attainment (% of population aged 30–34)	45.6	2016	47
People at risk of poverty or social exclusion (thousands)	2 336	2015	1 814

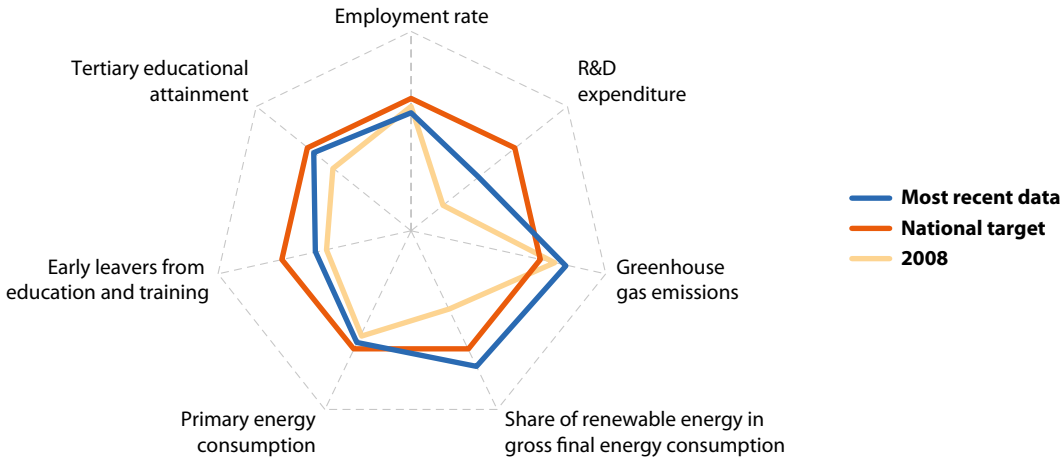
(1) Estimate/provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Bulgaria

Bulgaria reduced its non-ETS GHG emissions by 2.9 % between 1990 and 2015, staying within its national target to limit the rise in non-ETS sector GHG emissions to 20 % by 2020. In 2015, the country surpassed its renewable energy target and almost met its target on primary energy consumption. Although Bulgaria moved towards its national targets on early school leavers and tertiary education, it was still further away from both targets than the EU as a whole was to its respective EU target in 2016. The employment rate in Bulgaria deteriorated sharply between 2008 and 2011; the subsequent increase up to 2016 was not enough to bring the country closer to its 76 % target. Despite a steady rise in R&D expenditure between 2008 and 2015, Bulgaria would need to double its expenditure in the coming years to reach its goal of 1.5 % of GDP. Progress towards the country's poverty reduction target has been slow since the start of the crisis; in 2015, the number of people at risk of poverty after social transfers — used as a national target in the area of poverty reduction — was 2.8 % below its 2008 level but 13.5 % above the national 2020 target.

Figure 6.2: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.2: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	67.7	2016	76
Gross domestic expenditure on R&D (% of GDP)	0.96 (1)	2015	1.5
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 2.9 (1)	2015	20
Share of renewable energy in gross final energy consumption (%)	18.2	2015	16
Primary energy consumption (million tonnes of oil equivalent)	17.9	2015	16.9
Early leavers from education and training (% of population aged 18–24)	13.8	2016	11
Tertiary educational attainment (% of population aged 30–34)	33.8	2016	36
People at risk of poverty after social transfers (thousands)	1 586	2015	1 372 (2)

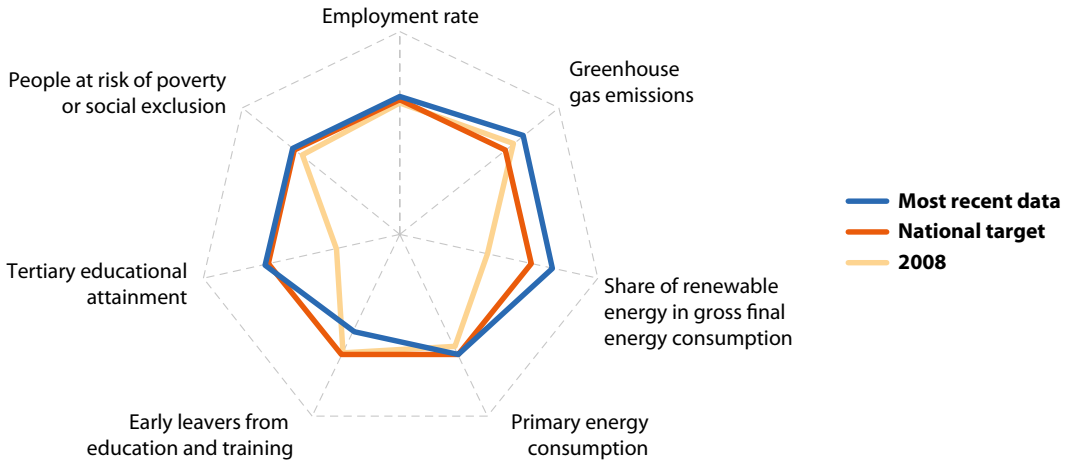
(1) Data are provisional.
(2) National target differs from the overall EU target on 'risk of poverty or social exclusion' as it refers to the sub-indicator 'people at risk of poverty after social transfers' only.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Czech Republic

The Czech Republic reduced its non-ETS GHG emissions by 8.8 % between 1990 and 2015, remaining within the national GHG emissions target to limit increases to 9 % by 2020. In 2015, the country had already met its national target on renewable energy. In 2016, the Czech Republic exceeded its national targets on employment and tertiary educational attainment by 1.7 and 0.8 percentage points, respectively. The dramatic reduction in the number of people at risk of poverty or social exclusion in 2015 helped the country surpass its national target of lifting 100 000 people out of the risk of poverty or social exclusion compared to 2008 levels with 22 000. The six percentage points decrease in primary energy consumption in the period 2008 to 2015 brought the Czech Republic very close to its national target. The gradual increase in the share of early school leavers from education and training between 2008 and 2016 narrowed the distance to the national target to only 1.1 percentage points.

Figure 6.3: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.3: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	76.7	2016	75
Gross domestic expenditure on R&D (% of GDP)	1.95 (1)	2015	1 (2)
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 8.8 (1)	2015	9
Share of renewable energy in gross final energy consumption (%)	15.1	2015	13
Primary energy consumption (million tonnes of oil equivalent)	39.9	2015	39.6
Early leavers from education and training (% of population aged 18–24)	6.6	2016	5.5
Tertiary educational attainment (% of population aged 30–34)	32.8	2016	32
People at risk of poverty or social exclusion (thousands)	1 444	2015	1 466

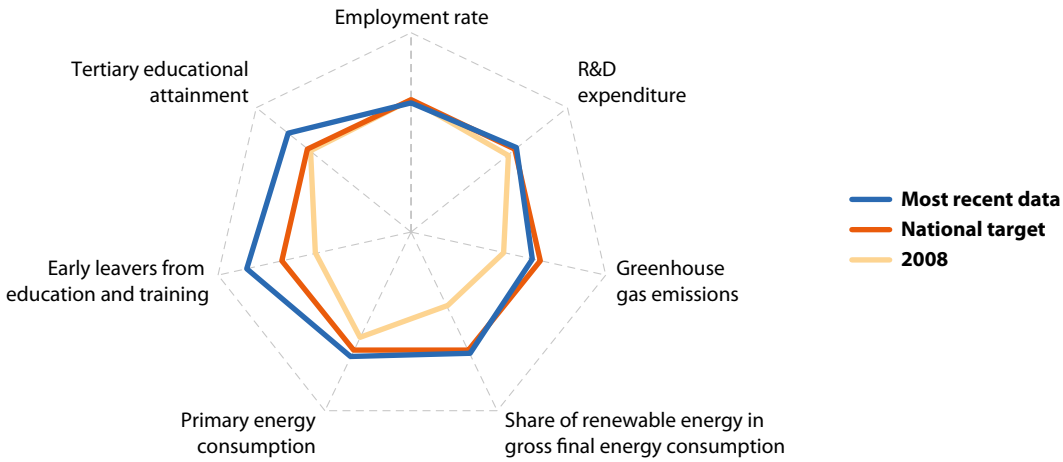
(1) Provisional data.
(2) National target refers to public sector expenditure only.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Denmark

In 2016, Denmark exceeded its national targets on early school leavers and tertiary educational attainment by about 3 and 8 percentage points, respectively. Denmark was the only Member State to exceed its national R&D expenditure target of 3 % of GDP in 2015. With a 15 % reduction in primary energy consumption and a 12.2 percentage point increase in the share of renewable energy in gross final energy consumption between 2008 and 2015, the country also surpassed its targets on energy efficiency and renewable energy. Despite a steady reduction in GHG emissions in non-ETS sectors since 2011, Denmark had not met its GHG emissions target by 2015. Although the country's employment rate has been rising since 2012, by 2016 it was still below the 2008 level and some distance from the national target of 80 %. The number of people living in households with very low work intensity — used in Denmark as a national target in the area of poverty and social exclusion — increased by 35 % between 2008 and 2015, pushing the country further from its national target.

Figure 6.4: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.4: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	77.4 (1)	2016	80
Gross domestic expenditure on R&D (% of GDP)	3.03 (2)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 15.0 (2)	2015	– 20
Share of renewable energy in gross final energy consumption (%)	30.8	2015	30
Primary energy consumption (million tonnes of oil equivalent)	16.5	2015	17.4
Early leavers from education and training (% of population aged 18–24)	7.2 (1)	2016	10
Tertiary educational attainment (% of population aged 30–34)	47.7 (1)	2016	40 (3)
People living in households with very low work intensity (thousands)	470	2015	325 (4)

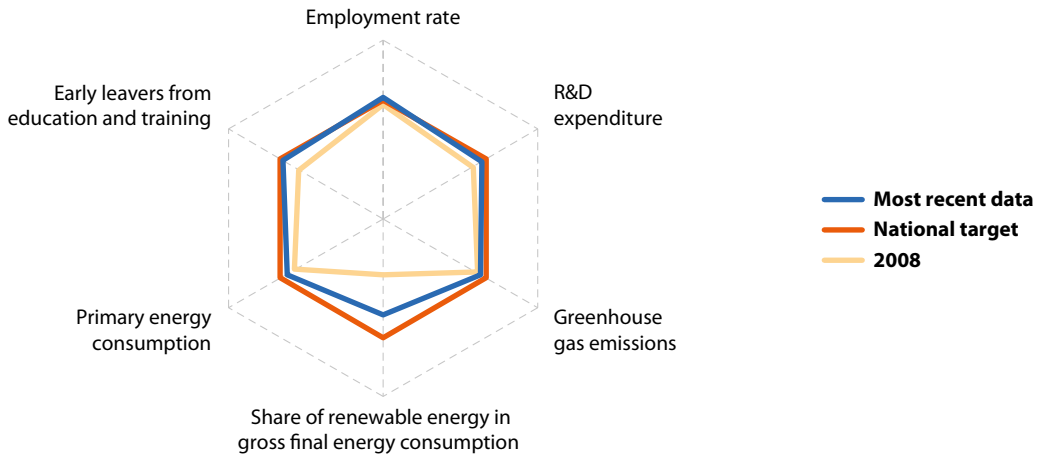
(1) Break in time series in 2016.
(2) Estimated/provisional data.
(3) National target: more than 40 %.
(4) National target differs from the overall EU target on 'risk of poverty or social exclusion' as it refers to the sub-indicator 'people living in households with very low work intensity' only.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Germany

Long-term unemployment, used in Germany as a national target for poverty and social exclusion, reduced by 56 % between 2008 and 2015. This allowed the country to exceed its target of reducing long-term unemployment by 20 % by 2020. Germany had already met its 77 % employment target by 2013 and continued to increase its employment rate until 2016. The country slightly exceeded its target on reducing early leavers from education and training in 2016. In that year it also surpassed its national target on tertiary educational attainment by nearly 6.1 percentage points, with 48.1 % of 30 to 34 year olds having completed post-secondary level education or equivalent. Germany's national target differs from that of other Member States because it includes post-secondary non-tertiary education (ISCED level 4) in addition to ISCED levels 5 to 8. Germany has almost closed the gap on its national targets for R&D expenditure. Between 2008 and 2015, it reduced the distance to its national targets on primary energy consumption and renewable energy by more than half. But a 4.7 percentage point gap to its target on GHG emissions in non-ETS sectors persisted in 2015.

Figure 6.5: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.5: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	78.7	2016	77
Gross domestic expenditure on R&D (% of GDP)	2.87 (1)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 9.3 (1)	2015	– 14
Share of renewable energy in gross final energy consumption (%)	14.6	2015	18
Primary energy consumption (million tonnes of oil equivalent)	292.9	2015	276.6
Early leavers from education and training (% of population aged 18–24)	10.2	2016	10 (2)
Tertiary educational attainment (% of population aged 30–34)	48.1 (3)	2016	42 (3)
Long-term unemployment (thousands)	723	2015	1 306 (4)

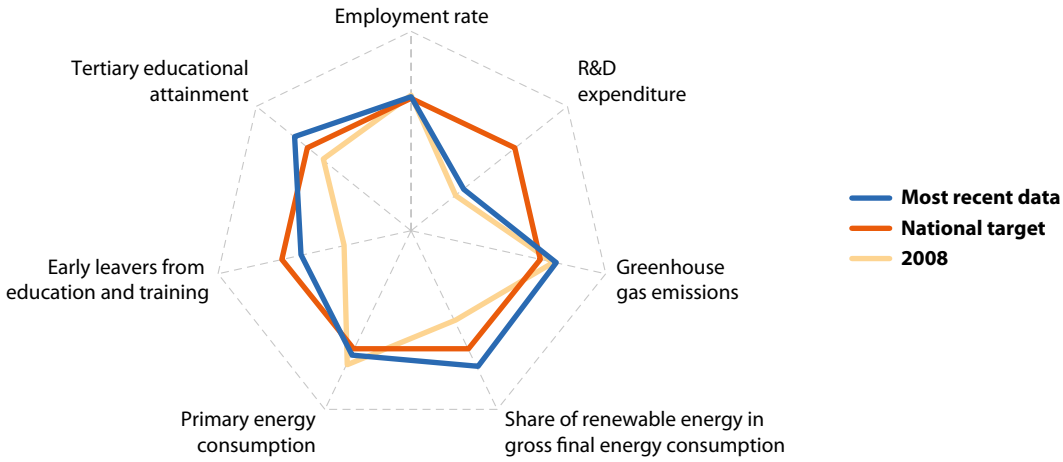
(1) Estimated/provisional data.
(2) National target: less than 10 %.
(3) Indicator and target refer to ISCED levels 4–8.
(4) National target differs from the overall EU target on 'risk of poverty or social exclusion' as it refers to long-term unemployed people.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators and lfsa_ugad), DESTATIS

Estonia

By 2015, Estonia had decreased its GHG emissions by 2.5 % compared to 1990 levels, remaining well below its national target, which allows emissions to increase by 11 % by 2020. In the same year, Estonia surpassed its targets on renewable energy and primary energy consumption by 3.6 percentage points and 4.8 %, respectively. In 2016, the country also exceeded its targets on tertiary education and employment by 5.4 and 0.6 percentage points, respectively. Despite a sizeable reduction in the share of early school leavers since 2008, Estonia was 1.4 percentage points below its national target in 2016. Gross expenditure on R&D has increased only slightly since 2008 and in 2015 the country was further from its national target than the EU was as a whole from its respective EU target. Since 2010 the share of the population living at risk of poverty after social transfers has increased gradually, pushing Estonia further from its national target to reduce monetary poverty to a rate of 15 %.

Figure 6.6: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.6: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	76.6	2016	76
Gross domestic expenditure on R&D (% of GDP)	1.5 (1)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 2.5 (1)	2015	11
Share of renewable energy in gross final energy consumption (%)	28.6	2015	25
Primary energy consumption (million tonnes of oil equivalent)	6.2	2015	6.5
Early leavers from education and training (% of population aged 18–24)	10.9	2016	9.5
Tertiary educational attainment (% of population aged 30–34)	45.4	2016	40
People at risk of poverty after social transfers (% of population)	21.6	2015	15 (2)

(1) Estimated/provisional data.

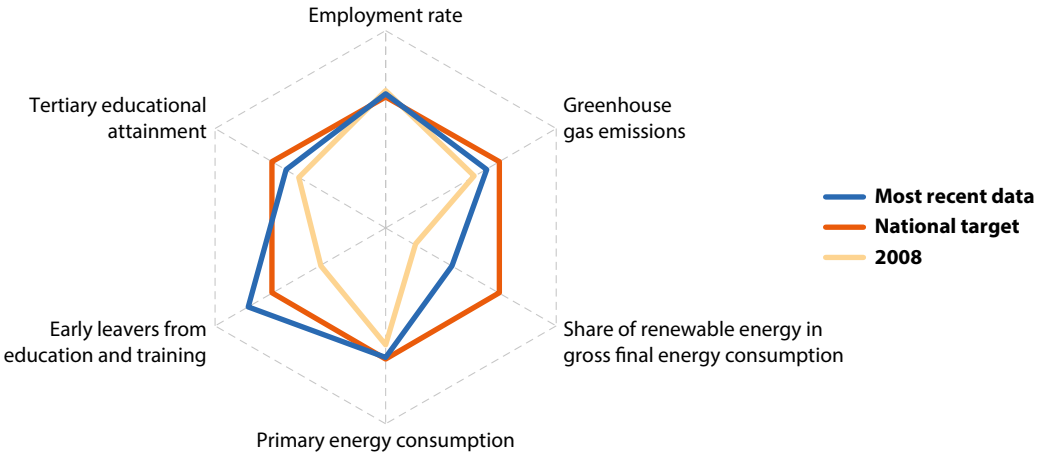
(2) National target differs from the overall EU target on 'risk of poverty or social exclusion' as it refers to the sub-indicator 'people at risk of poverty after social transfers' only.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Ireland

Ireland surpassed its employment target by 1.3 percentage points in 2016. The country also exceeded its target for early leavers from education and training, achieving a 5.1 percentage point reduction between 2008 and 2016. Although the share of tertiary graduates increased more or less steadily in the same period, Ireland has yet to meet its 60 % target — the second most ambitious tertiary education target among Member States. Ireland's R&D expenditure as a share of GDP has been fairly stable since 2009, maintaining a 0.5 percentage point gap to the national target of about 2 % (2.5 % of GNP) in 2014. Although Ireland had already met its primary energy consumption target in 2011, a slight increase in consumption in 2016 put the country just above its target again. Despite the gradual increase in the share of renewables in gross final energy consumption since 2008, a gap of 6.8 percentage points still needs to be closed in the next five years for the country to reach its 16 % target. Ireland would need to double its efforts in reducing its GHG emissions in non-ETS sectors compared to 1990 to meet its respective national target of – 20 %.

Figure 6.7: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.7: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	70.3	2016	69 (1)
Gross domestic expenditure on R&D (% of GDP)	1.51 (2)	2014	2 (3)
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 10.5 (2)	2015	– 20
Share of renewable energy in gross final energy consumption (%)	9.2	2015	16
Primary energy consumption (million tonnes of oil equivalent)	14.0	2015	13.9
Early leavers from education and training (% of population aged 18–24)	6.3	2016	8
Tertiary educational attainment (% of population aged 30–34)	52.9	2016	60
People at risk of poverty or social exclusion (thousands)	1 207	2015	: (4)

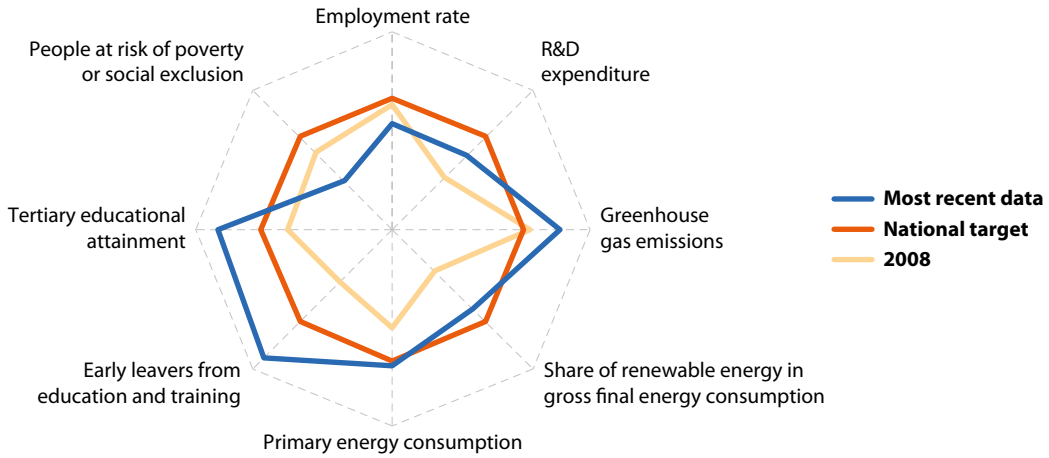
(1) National target: 69–71 %.
(2) Estimated/provisional data.
(3) National target: 2.5 % of GNP (approximately 2 % of GDP).
(4) National target: Reduce by a minimum of 200 000 the population in combined poverty (either consistent poverty, at-risk-of-poverty or basic deprivation).

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Greece

Partly as a result of the economic slowdown, by 2015 Greece had reduced its GHG emissions in non-ETS sectors by 30.2 % compared to 1990 levels, significantly exceeding its national target for a 4 % reduction by 2020. Greece had already met its target on primary energy consumption in 2013 and has stabilised its energy efficiency at almost the same level since then. In 2016, the country also surpassed its national targets on tertiary education and early leavers from education and training, by 10.7 and 3.8 percentage points, respectively. Between 2008 and 2015, Greece almost doubled its share of renewable energy in gross final energy consumption and increased its expenditure on R&D as a share of GDP, thus narrowing the distance to the respective national targets. In contrast, in 2016 it was the EU country with the lowest employment rate and the greatest distance to its employment target. Moreover, the number of people living at risk of poverty or social exclusion increased by about 783 000 between 2008 and 2015, increasing the distance to the national target to more than 1.2 million people.

Figure 6.8: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.8: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	56.2	2016	70
Gross domestic expenditure on R&D (% of GDP)	0.96 (1)	2015	1.2
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 30.2 (1)	2015	– 4
Share of renewable energy in gross final energy consumption (%)	15.4	2015	18
Primary energy consumption (million tonnes of oil equivalent)	23.7	2015	24.7
Early leavers from education and training (% of population aged 18–24)	6.2	2016	10 (2)
Tertiary educational attainment (% of population aged 30–34)	42.7	2016	32
People at risk of poverty or social exclusion (thousands)	3 829	2015	2 596

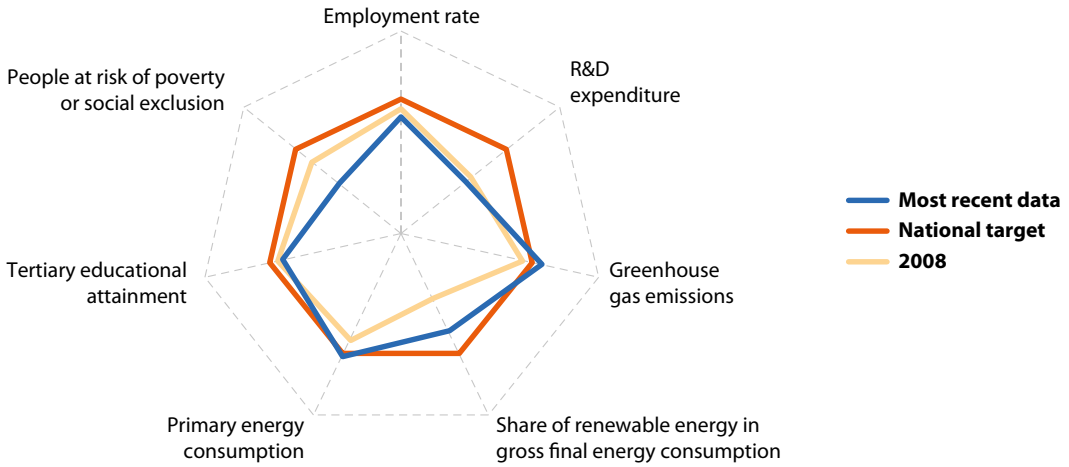
(1) Provisional data.
(2) National target: less than 10 %.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Spain

Spain exceeded its national target on GHG emissions in non-ETS sectors by 6.2 percentage points in 2015. The country also surpassed its primary energy consumption target and closed the distance to its renewable energy target to 3.8 percentage points. By reducing the school drop-out rate by 12.7 percentage points between 2008 and 2016, Spain made substantial progress towards its 2020 national target. In contrast, the share of 30 to 34 years olds with tertiary education fell slightly in 2015 and 2016, increasing the distance to the national target to 3.9 percentage points. Since 2008, the number of people at risk of poverty or social exclusion has risen sharply. Spain would need to lift some 3.8 million people out of risk of poverty to meet its 2020 objective. Although the country's employment rate has picked up since 2014, in 2016 it was still 10.1 percentage points behind its national target — the second largest gap in the EU. R&D spending has also fallen, however, the country was closer to its national target than the EU as a whole was to the EU 2020 target in 2015.

Figure 6.9: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.9: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	63.9	2016	74
Gross domestic expenditure on R&D (% of GDP)	1.22	2015	2
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 16.2 (1)	2015	– 10
Share of renewable energy in gross final energy consumption (%)	16.2	2015	20
Primary energy consumption (million tonnes of oil equivalent)	117.1	2015	119.8
Early leavers from education and training (% of population aged 18–24)	19.0	2016	15 (2)
Tertiary educational attainment (% of population aged 30–34)	40.1	2016	44
People at risk of poverty or social exclusion (thousands)	13 175	2015	9 386 (3)

(1) Provisional data.
(2) National target refers to school drop-out rate.
(3) National target: reduce the number of people at risk of poverty or social exclusion by 1 400 000 to 1 500 000 people (compared to 2008).

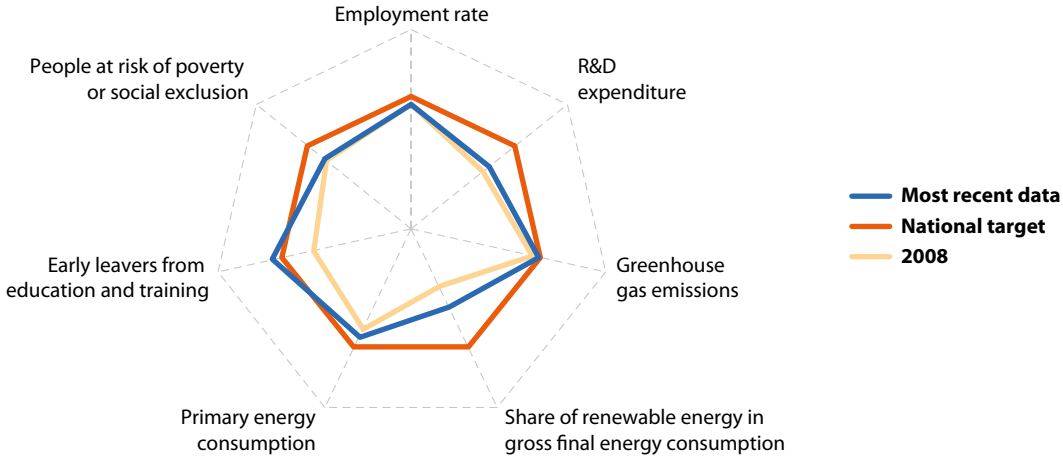
Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

France

In 2016, France met its Europe 2020 target for early leavers from education and training for a third consecutive year. By 2015 the country had moved closer to its target on primary energy consumption. Progress has also been achieved in tertiary educational attainment; however, the indicator used at EU level cannot directly be compared to the French target value of 50 %, which refers to the population aged 17 to 33. In terms of renewable energy, in 2015 France was the EU Member State with the second largest distance to its national target (7.8 percentage points).

Despite an overall reduction in GHG emissions in non-ETS sectors, by 2015 the country was still 1.4 percentage points away from its Europe 2020 goal. In 2016, France was also further from its employment target than the EU as a whole was from the EU target but slightly closer to its target on R&D expenditure (2015 data). Between 2008 and 2015, the number of people at risk of poverty or social exclusion was reduced by about 102 000, moving the country only slightly closer to its 2020 goal to reduce the number of people at risk by 1.9 million (compared to 2007).

Figure 6.10: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.10: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	70.0	2016	75
Gross domestic expenditure on R&D (% of GDP)	2.23 (1)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 12.6 (1)	2015	– 14
Share of renewable energy in gross final energy consumption (%)	15.2	2015	23
Primary energy consumption (million tonnes of oil equivalent)	239.4	2015	219.9
Early leavers from education and training (% of population aged 18–24)	8.8	2016	9.5
Tertiary educational attainment (% of population aged 30–34)	43.6	2016	50 (2)
People at risk of poverty or social exclusion (thousands)	11 048	2015	9 482 (3)

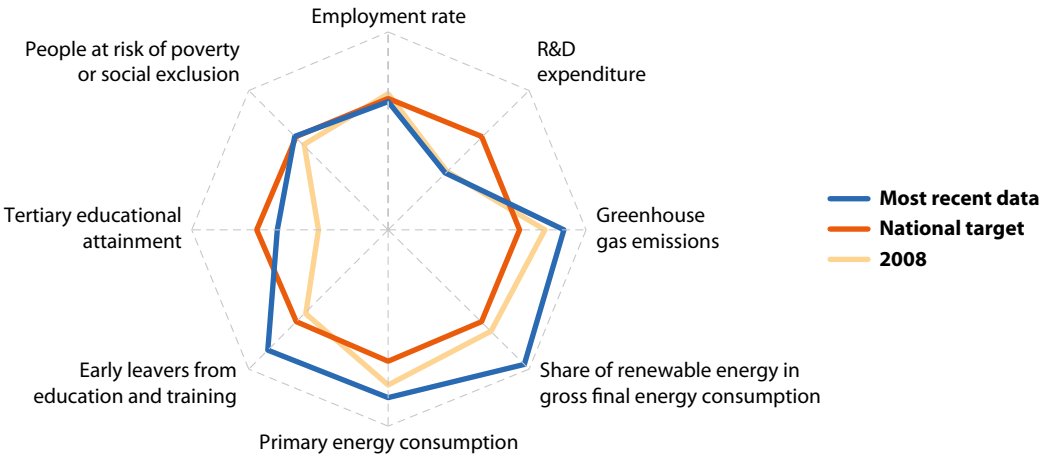
(1) Provisional data.
(2) National target differs from the overall EU target on 'tertiary educational attainment' as it refers to 17–33 year olds.
(3) National target: reduce by 1 900 000 the population living in poverty or social exclusion by 2020 (compared with 2007).

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Croatia

Croatia not only had by far the lowest rate of early leavers from education and training across the EU in 2016, but it also exceeded its 2020 target by 1.2 percentage points. A gradual reduction in the number of people at risk of poverty or social exclusion since 2013 helped the country reach its 2020 target in 2015. By 2015, the country had remained well within its target on GHG emissions in non-ETS sectors, which allows emissions to increase by up to 11 % by 2020 compared to 1990 levels. In 2015, the country also surpassed its national targets on renewable energy and primary energy consumption. The share of the population aged 30 to 34 with tertiary education increased by 11 percentage points in the period between 2008 and 2016, substantially reducing the distance to the national 2020 target. In 2015, Croatia slightly increased the distance to its national target on R&D expenditure compared to 2008 levels. The employment rate in Croatia started to pick up again in 2014 and the country has reduced the distance to its 62.9 % national target to 1.5 percentage points.

Figure 6.11: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.11: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	61.4	2016	62.9
Gross domestic expenditure on R&D (% of GDP)	0.85	2015	1.4
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 25.3 (1)	2015	11
Share of renewable energy in gross final energy consumption (%)	29.0	2015	20
Primary energy consumption (million tonnes of oil equivalent)	8.0	2015	11.5
Early leavers from education and training (% of population aged 18–24)	2.8 (2)	2016	4
Tertiary educational attainment (% of population aged 30–34)	29.5	2016	35
People at risk of poverty or social exclusion (thousands)	1 216	2015	1 220

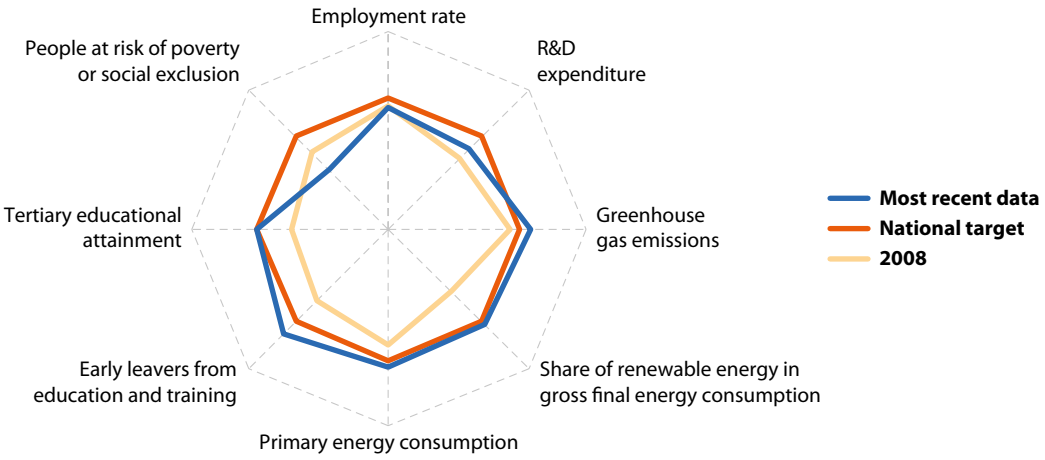
(1) Provisional data.
(2) Data with low reliability.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Italy

Italy achieved a 19.5 % reduction in GHG emissions in non-ETS sectors between 1990 and 2015, exceeding its national target by 6.5 percentage points. In 2015, the country also surpassed its national targets on renewable energy and primary energy consumption for a second and third consecutive year, respectively. Regarding education, Italy had exceeded its goals on early leavers from education and training and tertiary education by 2016; nevertheless, the country had the second lowest share of tertiary graduates in the EU in 2016 (26.2 % of 30 to 34 year olds). R&D expenditure has increased slightly since 2008 and in 2015 Italy was closer to its national target than the EU as a whole was to the EU target. In contrast, it has moved further away from its national targets on employment and poverty reduction since 2008 as a result of the economic crisis.

Figure 6.12: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.12: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	61.6	2016	67 (1)
Gross domestic expenditure on R&D (% of GDP)	1.33 (2)	2015	1.53
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 19.5 (2)	2015	– 13
Share of renewable energy in gross final energy consumption (%)	17.5	2015	17
Primary energy consumption (million tonnes of oil equivalent)	149.6	2015	158
Early leavers from education and training (% of population aged 18–24)	13.8	2016	16
Tertiary educational attainment (% of population aged 30–34)	26.2	2016	26 (3)
People at risk of poverty or social exclusion (thousands)	17 469	2015	12 882

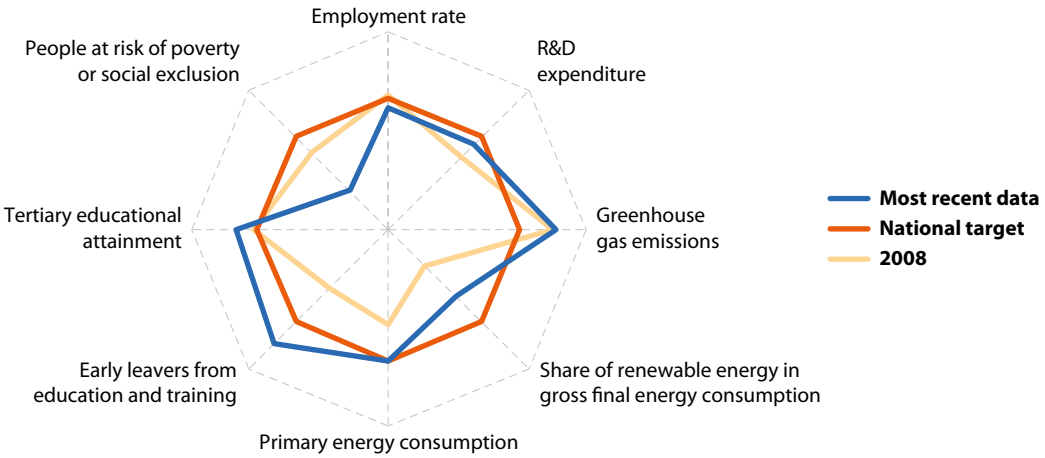
(1) National target: 67–69 %.
(2) Provisional data.
(3) National target: 26–27 %.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Cyprus

Cyprus exceeded its national target on tertiary educational attainment by 7.4 percentage points in 2016. In the same year, the country had also surpassed its target on early leavers from education and training by 2.3 percentage points and by 2015 had met its goal on primary energy consumption. Additionally, by 2015, Cyprus had recorded a reduction in non-ETS GHG emission compared to 1990 that was six times larger than the one envisaged in its Europe 2020 commitment. By 2015, the country was close to meeting its target on R&D expenditure and had reduced the distance to its renewable energy goal to 3.6 percentage points. However, its progress on employment and poverty reduction has reversed since the start of the economic crisis in 2008. In 2016, Cyprus's employment rate was 6.2 percentage points below its 75 % national target. The country would also need to lift 90 000 more people out of the risk of poverty and social exclusion to meet its 2020 commitment.

Figure 6.13: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.13: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	68.8	2016	75 (1)
Gross domestic expenditure on R&D (% of GDP)	0.46 (2)	2015	0.5
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 30.6	2015	– 5
Share of renewable energy in gross final energy consumption (%)	9.4	2015	13
Primary energy consumption (million tonnes of oil equivalent)	2.2	2015	2.2
Early leavers from education and training (% of population aged 18–24)	7.7	2016	10
Tertiary educational attainment (% of population aged 30–34)	53.4	2016	46
People at risk of poverty or social exclusion (thousands)	244	2015	154

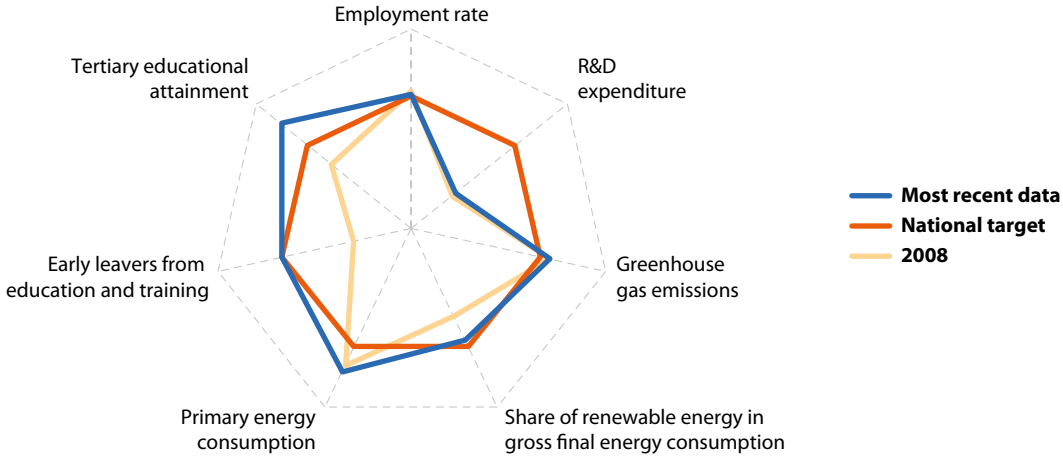
(1) National target: 75–77 %.
(2) Provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Latvia

Latvia has made notable progress on reducing the rate of early leavers from education and training and raising the share of tertiary graduates. The country reached its respective targets in 2013 and 2011 and continued to meet them in 2016. By 2016, it had already reached its national poverty reduction target by limiting the number of people at risk of poverty after social transfers and/or in households with very low work intensity to 606 000. Unlike the EU-level target, Latvia's poverty target refers to monetary poverty and very low work intensity only and does not take into account severe material deprivation. The country's GHG emissions in non-ETS sectors did not rise notably between 1990 and 2012, staying within the national target to limit emissions increases to 17 % by 2020. Since 2008, Latvia has fulfilled its commitment on primary energy consumption and has steadily moved towards its target of 40 % renewable energy in gross final energy consumption; this is the second most ambitious target for this indicator in the EU. By 2016, the country had also met its employment target of 73 %. Progress on R&D intensity has been slower, with only a slight increase between 2008 and 2015.

Figure 6.14: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.14: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	73.2	2016	73
Gross domestic expenditure on R&D (% of GDP)	0.63 (1)	2015	1.5
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	9.1 (1)	2015	17
Share of renewable energy in gross final energy consumption (%)	37.6	2015	40
Primary energy consumption (million tonnes of oil equivalent)	4.3	2015	5.4
Early leavers from education and training (% of population aged 18–24)	10.0	2016	10.0
Tertiary educational attainment (% of population aged 30–34)	42.8	2016	34 (2)
People at risk of poverty or social exclusion (thousands)	606 (3)	2015	619 (3)

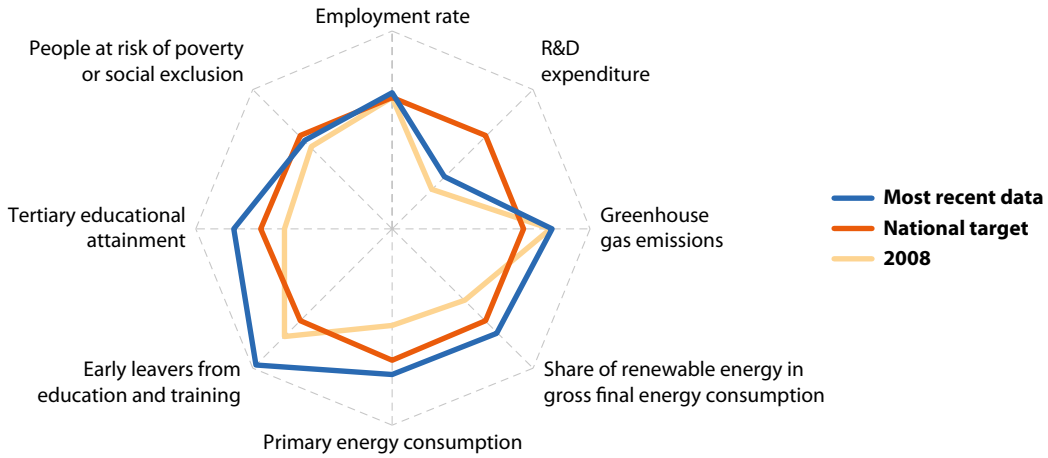
(1) Provisional data.
(2) National target: 34–36 %.
(3) Indicator and national target differ from the overall EU target on 'risk of poverty or social exclusion' as they refer to the two sub-indicators 'People living at risk of poverty after social transfers' and 'people living in households with very low work intensity' only

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Lithuania

In 2016, Lithuania had by far the highest share of 30 to 34 year olds with tertiary education in the EU (58.7 %) and exceeded its national target by 10 percentage points. In addition, its share of early leavers from education and training was almost half the EU rate and well below the 9 % national target. Notable progress has also been made on climate change and energy. By reducing its GHG emissions in non-ETS sectors by 9.9 % between 1990 and 2015, Lithuania has stayed well below its target to limit emission increases to 15 %. The country had also exceeded its renewable energy and primary energy consumption targets by 2015 for a second and fourth consecutive year, respectively. After a sharp drop in its employment level between 2008 and 2010, the rate climbed up again and in 2016 Lithuania surpassed its Europe 2020 goal by 2.4 percentage points. The country was also close to meeting its poverty reduction target by lifting around 857 000 people out of the risk of poverty and social exclusion between 2008 and 2015. In terms of R&D expenditure, a gap of 0.9 percentage point remains to be closed for the target of 1.9 % of GDP to be reached.

Figure 6.15: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.15: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	75.2	2016	72.8
Gross domestic expenditure on R&D (% of GDP)	1.04 (1)	2015	1.9
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 9.9 (1)	2015	15
Share of renewable energy in gross final energy consumption (%)	25.8	2015	23
Primary energy consumption (million tonnes of oil equivalent)	5.8	2015	6.5
Early leavers from education and training (% of population aged 18–24)	4.8	2016	9 (2)
Tertiary educational attainment (% of population aged 30–34)	58.7	2016	48.7
People at risk of poverty or social exclusion (thousands)	857	2015	814

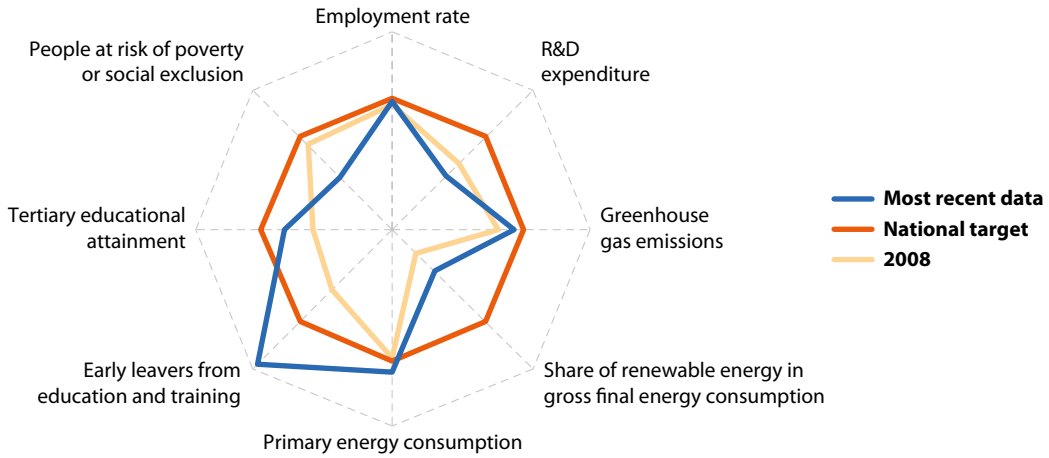
(1) Provisional data.
(2) National target: less than 9 %.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Luxembourg

Luxembourg has continuously exceeded its target on early leavers from education and training since 2009. It has also met its target on primary energy consumption since 2011. The country has the most ambitious tertiary education target of the EU, aiming for 66 % of the population aged 30 to 34 having attained tertiary education by 2020. Despite a 14.8 percentage point rise between 2008 and 2016, it still has further to go to meet its national target than other Member States. Although in 2016 Luxembourg was closer to its employment target than the EU as a whole, a gap of 2.3 percentage points persists. In 2015, it spent relatively less on R&D as a percentage of GDP than the EU overall and it has moved further from its national target since 2008. The number of people at risk of poverty or social exclusion rose by 32 % between 2008 and 2015, pushing Luxembourg further from its national target. It also did not reach its national target on expansion of renewable energy and had one of the lowest shares of renewables in gross final energy consumption in the EU in 2015. And its 13.6 % reduction in non-ETS GHG emissions in 2015 (compared to 1990) was not enough for the country to reach its target to reduce emissions by 20 %.

Figure 6.16: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.16: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	70.7	2016	73
Gross domestic expenditure on R&D (% of GDP)	1.31 (1)	2015	2.3 (2)
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 13.6	2015	– 20
Share of renewable energy in gross final energy consumption (%)	5.0	2015	11
Primary energy consumption (million tonnes of oil equivalent)	4.1	2015	4.5
Early leavers from education and training (% of population aged 18–24)	5.5	2016	10 (3)
Tertiary educational attainment (% of population aged 30–34)	54.6 (4)	2016	66
People at risk of poverty or social exclusion (thousands)	95	2015	66

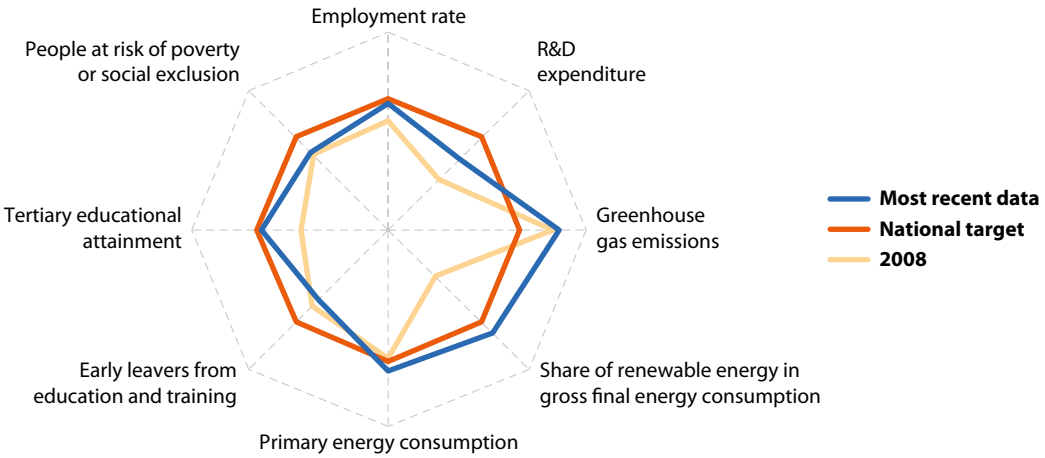
(1) Estimated/provisional data.
(2) National target: 2.3–2.6 %.
(3) National target: less than 10 %.
(4) Data has low reliability.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Hungary

By reducing its GHG emissions in non-ETS sectors by 22.5 % between 1990 and 2015, Hungary remained well within its target to limit emission increases to 10 % by 2020. The country has also remained within its target on primary energy consumption and has fulfilled its commitments on renewable energy. Progress towards the national education targets has been ambiguous since 2008. Although Hungary met its national target on tertiary education in 2014, a reduction in the attainment rate in 2016 reopened the gap by one percentage point. An increase in the share of early school leavers from education and training over the past two years also widened the target gap. In terms of R&D expenditure, Hungary was just 0.4 percentage points below its national target in 2015, putting it closer to its target than the EU was to its overall target. Poverty levels have deteriorated since the onset of the economic crisis, meaning about 391 000 people still need to be lifted out of the risk of poverty or social exclusion for Hungary to meet its 2020 target. Despite an improvement in the employment rate between 2011 and 2016, the country was still 3.5 percentage points from its national target of 75 %.

Figure 6.17: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.17: National Europe 2020 indicators: most recent data and targets

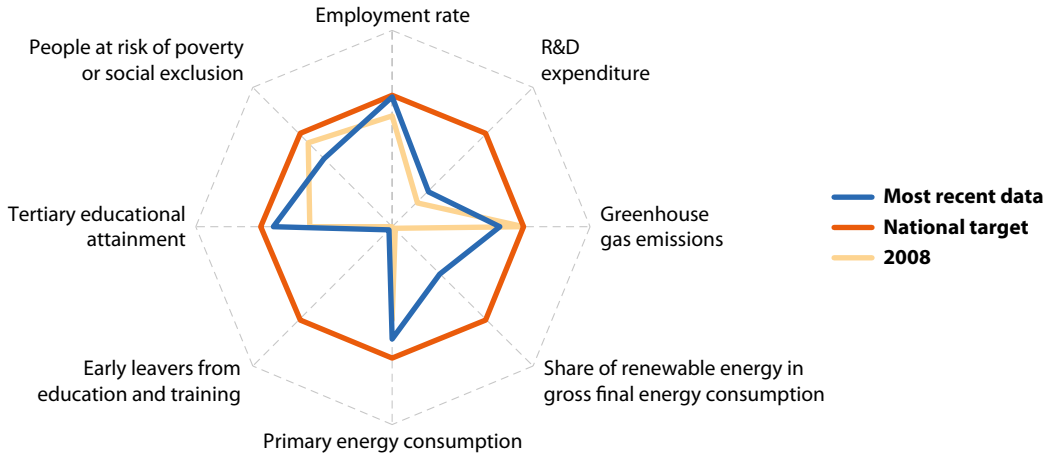
	Data	Year	Target
Employment rate age group 20–64 (%)	71.5	2016	75
Gross domestic expenditure on R&D (% of GDP)	1.38	2015	1.8
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 22.5	2015	10
Share of renewable energy in gross final energy consumption (%)	14.5	2015	13
Primary energy consumption (million tonnes of oil equivalent)	22.3	2015	24.1
Early leavers from education and training (% of population aged 18–24)	12.4	2016	10
Tertiary educational attainment (% of population aged 30–34)	33	2016	34
People at risk of poverty or social exclusion (thousands)	2 735	2015	2 344

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Malta

A steady increase in the employment rate between 2014 and 2016 brought Malta within reaching distance of its respective Europe 2020 target. The share of 30 to 34 years olds with tertiary education increased continuously between 2008 and 2015, bringing it within 3.2 percentage points of the national target. In 2015, the country shortened the distance to its primary energy consumption target to 0.1 Mtoe. In contrast, between 1990 and 2015, it increased its GHG emissions in non-ETS sectors by 25.1 %, greatly exceeding its Europe 2020 target of limiting emission increases to 5 %. Malta also lags behind the EU as a whole in terms of renewable energy and R&D expenditure. The number of people at risk of poverty and social exclusion increased by 16 % between 2008 and 2015, moving the country further away from its Europe 2020 goal. Despite a significant drop in the share of early leavers from education and training since 2008, in 2015 Malta had further to go to reach its national 2020 target than other Member States.

Figure 6.18: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below. The 2008 value for early leavers from education and training exceeds the axis range.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.18: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	69.6	2016	70
Gross domestic expenditure on R&D (% of GDP)	0.77 (1)	2015	2
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	25.1 (1)	2015	5
Share of renewable energy in gross final energy consumption (%)	5	2015	10
Primary energy consumption (million tonnes of oil equivalent)	0.8	2015	0.7
Early leavers from education and training (% of population aged 18–24)	19.6	2016	10
Tertiary educational attainment (% of population aged 30–34)	29.8	2016	33
People at risk of poverty or social exclusion (thousands)	94	2015	74.44

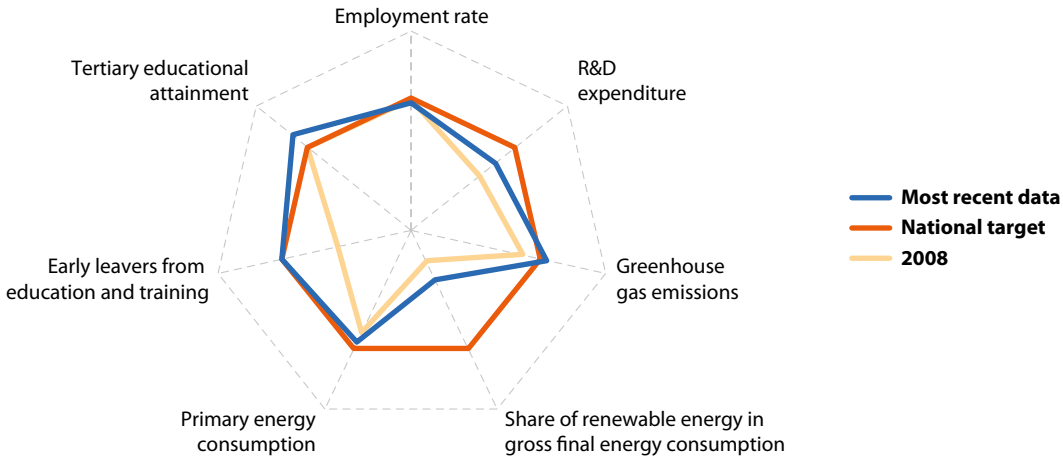
(1) Provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Netherlands

The Netherlands had already exceeded its target on tertiary educational attainment in 2008 and the share of 30 to 34 year olds with tertiary educational attainment has continued to rise. In 2016, the country also reached its national targets on early leavers from education and training and surpassed its target on reducing GHG emissions in non-ETS sectors by at least 16 % compared to 1990 levels. Despite a deterioration in labour market conditions since 2008, the Netherlands was closer to its employment target in 2016 than the EU overall was to its target. Since 2008, the country has also moved closer to its target on R&D expenditure than the EU has to its overall target. In contrast, the Netherlands was the country furthest from its renewable energy target and still had a gap of 3.6 Mtoe to close before reaching its primary energy consumption target. The situation concerning the number of people at risk of poverty or social exclusion has deteriorated since 2008. However, it is not possible to make a comparison with the national target as it refers to people aged 0 to 64 living in a jobless household.

Figure 6.19: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.19: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	77.1	2016	80
Gross domestic expenditure on R&D (% of GDP)	2.01 (1)	2015	2.5
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 20.0	2015	– 16
Share of renewable energy in gross final energy consumption (%)	5.8	2015	14
Primary energy consumption (million tonnes of oil equivalent)	64.3	2015	60.7
Early leavers from education and training (% of population aged 18–24)	8	2016	8
Tertiary educational attainment (% of population aged 30–34)	45.7	2016	40 (2)
People at risk of poverty or social exclusion (thousands)	2 744	2015	: (3)

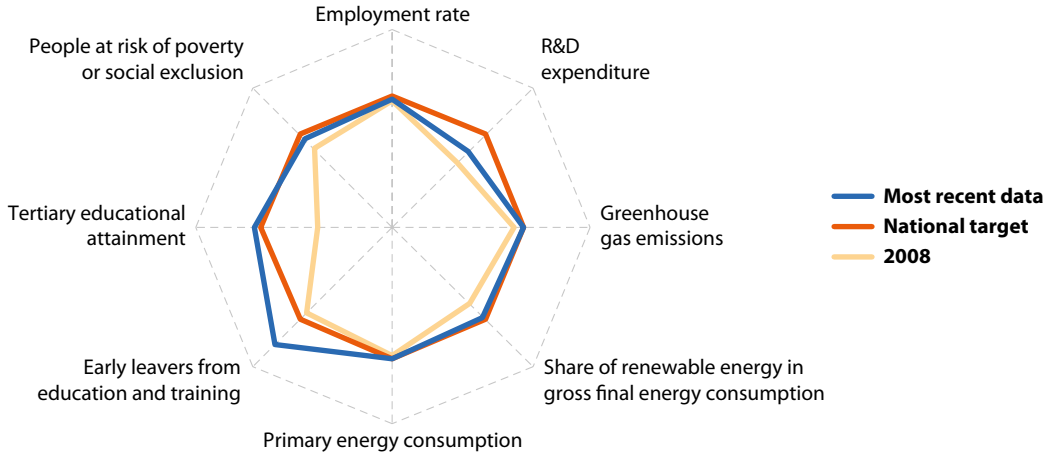
(1) Provisional data.
(2) National target: more than 40 %.
(3) National target: Reduce by 100 000 the number of people (aged 0–64) living in a jobless household (compared to 2008).

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Austria

In 2016, Austria continued to meet both of its education targets, with only 6.9 % of pupils leaving school early and 40.1 % of 30 to 34 year olds having completed tertiary education. Since 2009, Austria has continuously met its primary energy consumption target and in 2015 the country moved to within reaching distance of its renewable energy target. With a 74.8 % employment rate in 2016, the country was closer to its national target of 77 % than the EU was to its overall target of 75 %. Despite having one of the highest R&D intensities (R&D expenditure as a share of GDP) across the EU, in 2015 Austria was still 0.7 percentage points away from its target, partly because this target was very ambitious to begin with. In spite of a 15.2 % reduction in GHG emissions in non-ETS by 2015 compared to 1990 levels, the country remained further from its national target than the EU was from its overall target. Progress in the area of poverty reduction has been slow since 2008; Austria would need to raise about 87 000 people out of the risk of poverty and social exclusion to meet its Europe 2020 commitment.

Figure 6.20: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.20: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	74.8	2016	77
Gross domestic expenditure on R&D (% of GDP)	3.07 (1)	2015	3.76
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 15.2 (1)	2015	– 16
Share of renewable energy in gross final energy consumption (%)	33	2015	34
Primary energy consumption (million tonnes of oil equivalent)	31.3	2015	31.5
Early leavers from education and training (% of population aged 18–24)	6.9	2016	9.5
Tertiary educational attainment (% of population aged 30–34)	40.1	2016	38
People at risk of poverty or social exclusion (thousands)	1 551	2015	1 464

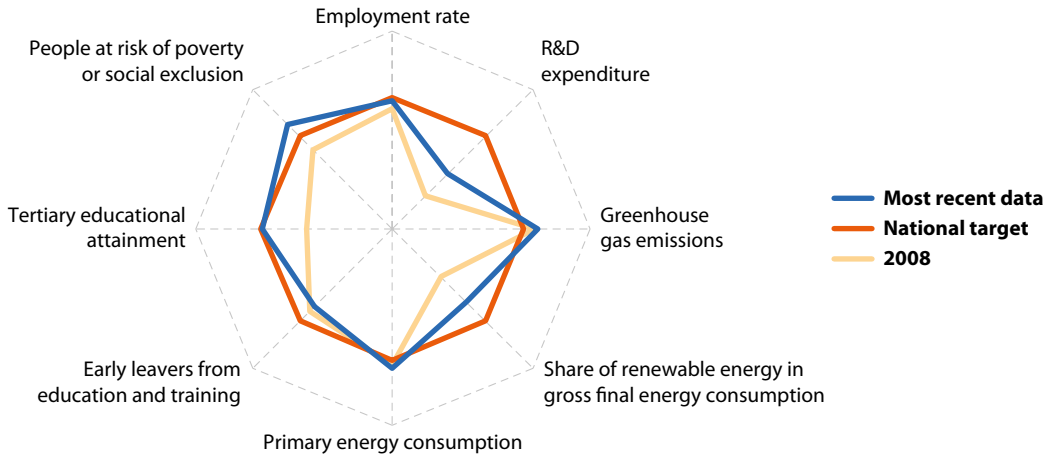
(1) Estimated/provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Poland

Despite a 2.3 % increase in GHG emissions in non-ETS sectors between 1990 and 2015, Poland remained within its target of limiting emissions to a 14 % increase by 2020. Against the backdrop of the economic crisis, Poland has continuously reduced the number of people living at risk of poverty or social exclusion since 2008 and in 2015 exceeded its target for a third consecutive year. The country also surpassed its goal on primary energy consumption and came within reaching distance of its tertiary education target, which foresees 45 % of 30 to 34 years olds having completed tertiary education by 2020. The country performed slightly better than the EU as a whole in terms of boosting employment and R&D expenditure. Poland was a similar distance from its renewable energy and early school leavers targets as the EU, although the EU has more ambitious targets for both of these indicators.

Figure 6.21: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.21: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	69.3	2016	71
Gross domestic expenditure on R&D (% of GDP)	1 (1)	2015	1.7
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	2.3 (1)	2015	14
Share of renewable energy in gross final energy consumption (%)	11.8	2015	15
Primary energy consumption (million tonnes of oil equivalent)	90	2015	96.4
Early leavers from education and training (% of population aged 18–24)	5.2	2016	4.5
Tertiary educational attainment (% of population aged 30–34)	44.6	2016	45
People at risk of poverty or social exclusion (thousands)	8 761	2015	9 991

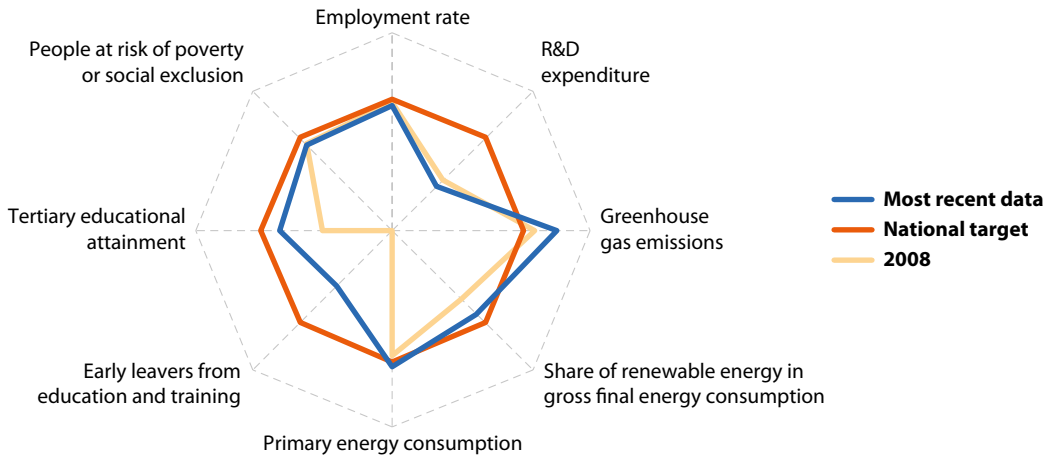
(1) Estimated/provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Portugal

By 2015, Portugal had reduced its GHG emissions in non-ETS sectors by 23.9 % compared to 1990 levels, remaining well below its target for no more than a 1 % increase by 2020. Since 2011, the country has continuously met its primary energy consumption target. By 2015 it had reduced the distance to its renewable energy target to three percentage points. Portugal has also achieved a notable reduction in the share of early leavers from education and training, narrowing the gap to its respective target by 20.9 percentage points between 2008 and 2016. Despite a steady increase in tertiary educational attainment since 2010, it was still 5.4 percentage points away from its respective Europe 2020 target. Portugal's progress towards its national employment and poverty reduction targets was hit hard by the economic crisis. Although the employment rate has been on a slow upward path since 2014, the country has not been able to close the gap to its Europe 2020 target or to return to its 2008 level. The number of people at risk of poverty or social exclusion would need to be reduced by 208 000 by 2020 for Portugal to meet its national commitment.

Figure 6.22: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below. The 2008 value for early leavers from education and training exceeds the axis range.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.22: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	70.6	2016	75
Gross domestic expenditure on R&D (% of GDP)	1.28 (1)	2015	2.7 (2)
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 23.9 (1)	2015	1
Share of renewable energy in gross final energy consumption (%)	28	2015	31
Primary energy consumption (million tonnes of oil equivalent)	21.7	2015	22.5
Early leavers from education and training (% of population aged 18–24)	14	2016	10
Tertiary educational attainment (% of population aged 30–34)	34.6	2016	40
People at risk of poverty or social exclusion (thousands)	2 765	2015	2 557

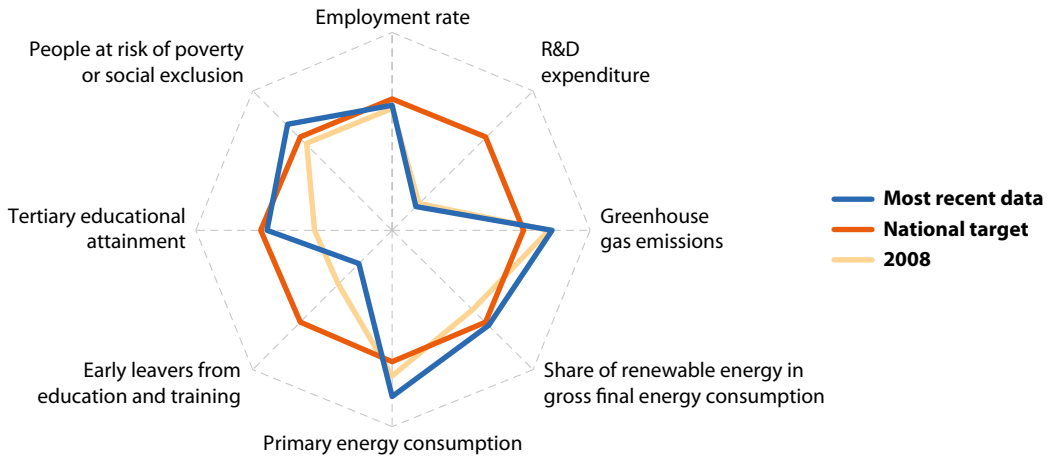
(1) Provisional data.
(2) National target: 2.7–3.3 %.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Romania

By 2015, Romania had reduced its GHG emissions in non-ETS sectors by 5.8 % compared to 1990 levels, remaining well within its 2020 target to limit the increase to 19 %. It also significantly reduced the number of people at risk of poverty or social exclusion by 1.7 million between 2008 and 2015, and had already met its national target in 2013. In 2015, the country exceeded its commitment to reaching a 24 % share of renewable energy in gross final energy consumption and remained well below its national target on primary energy consumption. Although it fell 1.1 percentage points short of its tertiary education target in 2016, Romania has made strong progress by raising the tertiary educational attainment rate by 9.6 percentage points between 2008 and 2016. In contrast, its share of early leavers from education and training increased to 18.5 % in the same time period, widening the distance to the national target to 7.2 percentage points. Despite a slow rise in the employment rate between 2013 and 2016, a 3.7 percentage point gap remains to be closed by 2020. Romania's R&D intensity fell by 0.08 percentage points between 2008 and 2015, pushing it further form its national target than other Member States.

Figure 6.23: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.23: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	66.3	2016	70
Gross domestic expenditure on R&D (% of GDP)	0.49	2015	2
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 5.8 (1)	2015	19
Share of renewable energy in gross final energy consumption (%)	24.8	2015	24
Primary energy consumption (million tonnes of oil equivalent)	31.3	2015	43.0
Early leavers from education and training (% of population aged 18–24)	18.5	2016	11.3
Tertiary educational attainment (% of population aged 30–34)	25.6	2016	26.7
People at risk of poverty or social exclusion (thousands)	7 435 (1)	2015	8 535

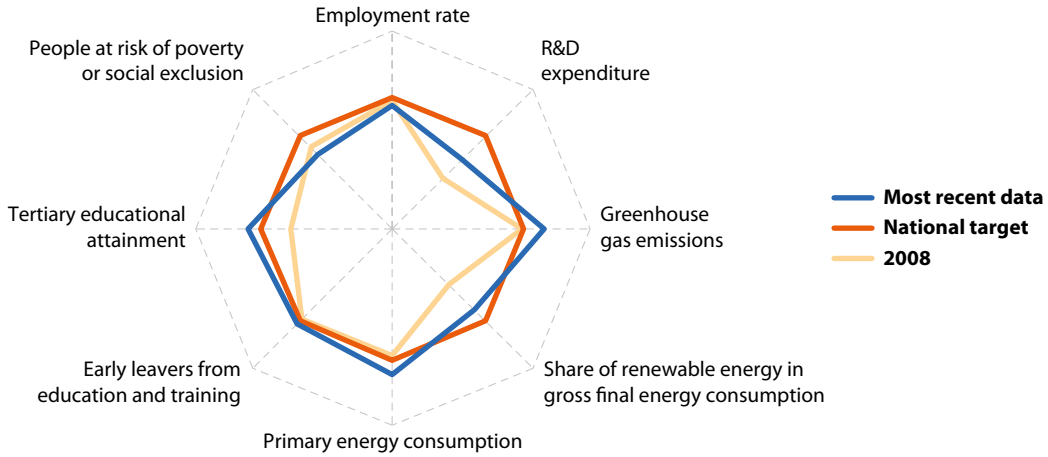
(1) Provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Slovenia

By reducing its GHG emissions in non-ETS sectors by 11.6 % between 1990 and 2015, Slovenia remained within its target to limit increases to 4 % by 2020. Since 2009, the country has continuously met its energy efficiency target, which caps primary energy consumption at 7.3 Mtoe. Slovenia has already met both of its education targets, with only 4.9 % of the population aged 18 to 24 leaving school early and 44.2 % of 30 to 34 year olds having tertiary educational attainment in 2016. In 2015, Slovenia was slightly closer to meeting its R&D expenditure and renewable energy commitments than the EU as a whole was to its overall commitments. After deteriorating continuously between 2008 and 2013, the employment rate increased to 70.1 % in 2016, putting it within 4.9 percentage points of its national target. Between 2008 and 2015, the number of people at risk of poverty or social exclusion in Slovenia increased by 24 000, which translates to a gap of 64 000 people to its national target.

Figure 6.24: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.24: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	70.1	2016	75
Gross domestic expenditure on R&D (% of GDP)	2.21 (1)	2015	3
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 11.6 (1)	2015	4
Share of renewable energy in gross final energy consumption (%)	22	2015	25
Primary energy consumption (million tonnes of oil equivalent)	6.5	2015	7.3
Early leavers from education and training (% of population aged 18–24)	4.9	2016	5
Tertiary educational attainment (% of population aged 30–34)	44.2	2016	40
People at risk of poverty or social exclusion (thousands)	385	2015	321

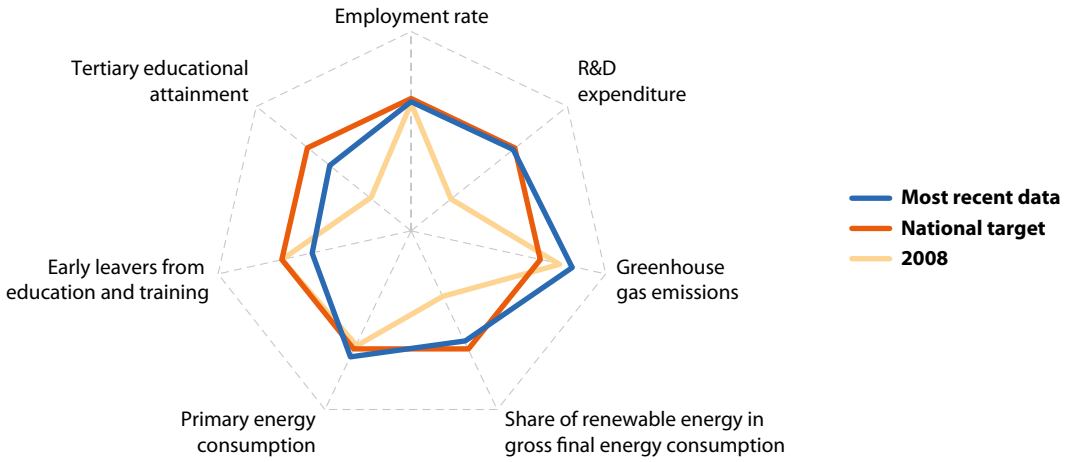
(1) Provisional data.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Slovakia

By 2015, GHG emissions in non-ETS sectors in Slovakia had fallen by 14 % compared to 1990 levels. The country thus remained well below its long-term commitment of limiting emissions growth to 13 % by 2020. Since 2011, Slovakia has met its energy efficiency target, which caps primary energy consumption at 16.4 Mtoe. In 2015, it was close to its R&D target and it was nearer to its target on renewable energy than the EU as a whole was to the respective EU target. Although Slovakia had already met its early leavers from education and training target in 2008, the indicator has since deteriorated and by 2015 the country was 1.4 percentage points away from its respective target. The country has recorded a substantial rise in the share of 30 to 34 year olds with a tertiary education since 2008 but a gap of 8.5 percentage points remains to be closed by 2020. The country's employment rate, after stagnating at around 65 % between 2010 and 2013, increased to 69.8 % in 2016, thus reducing the gap to the national target to 2.2 percentage points. Since 2008, Slovakia has moved closer to its poverty reduction target, which is expressed as the share of the population at risk of poverty or social exclusion, and was in 2015 within 1.2 percentage points of its 2020 goal.

Figure 6.25: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.25: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	69.8	2016	72
Gross domestic expenditure on R&D (% of GDP)	1.18	2015	1.2
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 14.0 (1)	2015	13
Share of renewable energy in gross final energy consumption (%)	12.9	2015	14
Primary energy consumption (million tonnes of oil equivalent)	15.4	2015	16.4
Early leavers from education and training (% of population aged 18–24)	7.4	2016	6
Tertiary educational attainment (% of population aged 30–34)	31.5	2016	40
People at risk of poverty or social exclusion (% of population) (2)	18.4	2015	17.2

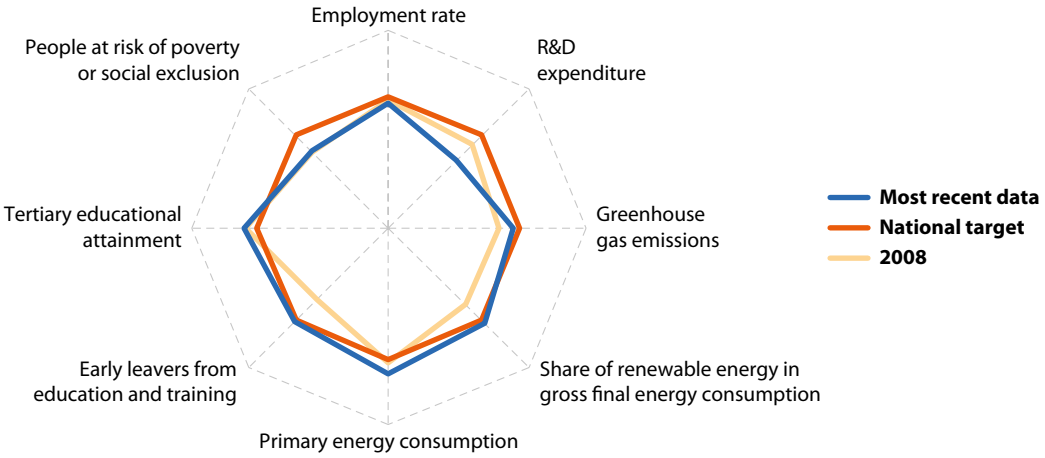
(1) Provisional data.
(2) The national target uses '% of the population' instead of 'number of people'.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Finland

With 46.1 % of the population aged 30 to 34 having completed tertiary education in 2016, Finland continued to exceed its national target of 42 %. However, its target is defined more narrowly than the EU target as it excludes former tertiary Vocational Education and Training. In the same year, the country also reached its target on early leavers from education and training. With a 39.3 % share of renewable energy in final energy consumption, Finland exceeded its 2020 commitment by 1.3 percentage points in 2015. The country's primary energy consumption amounted to 32 Mtoe in 2015, which was below its 35.9 Mtoe target. As a result of a continuous fall in R&D expenditure as a share of GDP since 2009, Finland lost its leading position in terms of R&D intensity and moved away from its ambitious national target. The country's employment rate fell from 75.8 % in 2008 to 73.4 % in 2016, increasing the distance to its 78 % national target. Despite a notable 8.4 percentage point reduction in GHG emissions in non-ETS sectors between 1990 and 2015, the gap to the national target remained larger than for most other EU countries. Finland would also need to lift 134 000 more people out of the risk of poverty and social exclusion to meet its 2020 commitment.

Figure 6.26: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.26: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	73.4	2016	78
Gross domestic expenditure on R&D (% of GDP)	2.9	2015	4
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 11.2 (1)	2015	– 16
Share of renewable energy in gross final energy consumption (%)	39.3	2015	38
Primary energy consumption (million tonnes of oil equivalent)	32.0	2015	35.9
Early leavers from education and training (% of population aged 18–24)	7.9	2016	8
Tertiary educational attainment (% of population aged 30–34)	46.1	2016	42 (2)
People at risk of poverty or social exclusion (thousands)	904	2015	770

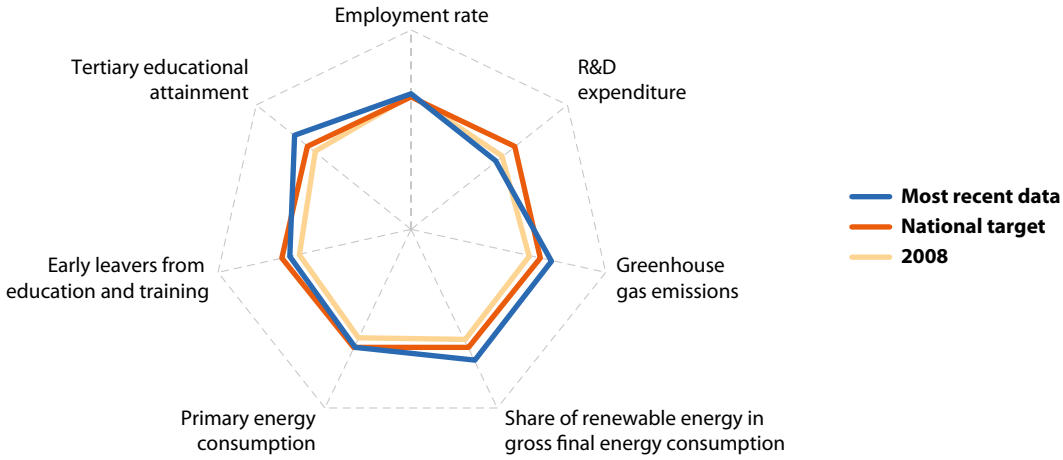
(1) Provisional data.
(2) Narrower national definition.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Sweden

With 51 % of its population aged 30 to 34 years having attained a tertiary education in 2016, Sweden exceeded its national 2020 target by 6 percentage points. In the same year, it exceeded its employment target by 1.2 percentage points and had one of the highest employment rates in the EU. In 2015, Sweden also surpassed its renewable energy target by increasing the share of renewables in gross final energy consumption to 53.9 % — by far the best performance in the EU. The country had reduced its primary energy consumption to 43.7 Mtoe by 2015, bringing it close to its 2020 target of 43.4 Mtoe. By reducing its GHG emissions by 24.2 % between 1990 and 2015, Sweden met its respective national target for a third consecutive year. It also met its commitment on early leavers from education and training in 2015, but the slight increase in the share of early school leavers in 2016 nudged the country away from its target. Despite having the highest R&D intensity across the EU, a 0.74 percentage point gap remains to be closed between 2015 and 2020 to meet the ambitious national target of spending 4 % of GDP on R&D.

Figure 6.27: Change since 2008 in relation to national targets (*)



(*) Most recent year for which data are available; see table below.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Table 6.27: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	81.2	2016	80 (1)
Gross domestic expenditure on R&D (% of GDP)	3.26 (2)	2015	4
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 24.2	2015	– 17
Share of renewable energy in gross final energy consumption (%)	53.9	2015	49
Primary energy consumption (million tonnes of oil equivalent)	43.7	2015	43.4
Early leavers from education and training (% of population aged 18–24)	7.4	2016	7 (3)
Tertiary educational attainment (% of population aged 30–34)	51	2016	45 (4)
People at risk of poverty or social exclusion (thousands)	1 555	2015	: (5)

(1) National target: More than 80 %.
(2) Provisional data.
(3) National target: less than 7 %.
(4) National target: 45–50 %.
(5) National target: Reduction in the percentage of women and men (aged 20–64) who are not in the labour force (except full-time students), the long-term unemployed or those on long-term sick leave to well under 14 %.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

United Kingdom

The United Kingdom has not adopted specific national Europe 2020 targets apart from the already existing climate change and renewable energy commitments (as a consequence, no radar chart can be shown for the UK). After rising continuously since 2011, the country's employment rate reached a decade high of 77.6 % in 2016, exceeding the EU aggregate performance of 70.1 %. In the period between 2008 and 2016, the UK managed to increase its tertiary educational attainment rate from 39.5 % to 48.1 %. The indicator on early school leavers recorded a 3.7 percentage point reduction over a five-year period, from 14.9 % in 2011 to 11.2 % in 2016. Although nearly 243 000 people were lifted out of the risk of poverty between 2014 and 2015, there were still 0.9 million more people at risk of poverty or social exclusion compared to 2008. R&D expenditure increased to 1.7 % of GDP in 2015, a value close to the 2008 level. Between 1990 and 2015, the country had reduced its GHG emissions in non-ETS sectors by 15.6 %, putting it within reaching distance of its Europe 2020 reduction target of 16 %. Regarding renewable energy, the UK was the third furthest country (after France and the Netherlands and along with Ireland) from its renewable energy target in 2015 with a gap of 6.8 percentage points. Between 2008 and 2015, it reduced its primary energy consumption by 27.7 Mtoe, shortening the distance to its 2020 target of 177.6 Mtoe.

Table 6.28: National Europe 2020 indicators: most recent data and targets

	Data	Year	Target
Employment rate age group 20–64 (%)	77.6	2016	: (1)
Gross domestic expenditure on R&D (% of GDP)	1.7 (2)	2015	: (1)
Greenhouse gas emissions in non-ETS sectors (% change since ESD base year)	– 15.6 (2)	2015	– 16
Share of renewable energy in gross final energy consumption (%)	8.2	2015	15
Primary energy consumption (million tonnes of oil equivalent)	183	2015	177.6
Early leavers from education and training (% of population aged 18–24)	11.2	2016	: (1)
Tertiary educational attainment (% of population aged 30–34)	48.1	2016	: (1)
People at risk of poverty or social exclusion (thousands)	15 028	2015	: (3)

(1) No target in the National Reform Programme.
(2) Estimated/provisional data.
(3) Existing numerical targets under the umbrella of the 2010 Child Poverty Act and the Child Poverty Strategy 2011-2014.

Source: Eurostat (see dedicated web section: Europe 2020 headline indicators)

Abbreviations and acronyms

Geographical aggregates and countries

EU-28 The 28 Member States of the European Union since 1 July 2013 (BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK)

EU-27 The 27 Member States of the European Union from 1 January 2007 to 30 June 2013 (BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK)

G20 Group of 20 (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, the United States and the European Union)

Note that EU aggregates are back-calculated when enough information is available — for example, data relating to the EU-28 aggregate is presented when possible for periods before Croatia joined the EU in 2013 and the accession of Bulgaria and Romania in 2007, as if all 28 Member States had always been members of the EU. The label is changed if the data refer to another aggregate (EU-27).

European Union Member States

BE Belgium

BG Bulgaria

CZ Czech Republic

DK Denmark

DE Germany

EE Estonia

IE Ireland

EL Greece

ES Spain

FR France

HR	Croatia
IT	Italy
CY	Cyprus
LV	Latvia
LT	Lithuania
LU	Luxembourg
HU	Hungary
MT	Malta
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia
FI	Finland
SE	Sweden
UK	United Kingdom

European Free Trade Association (EFTA)

IS	Iceland
LI	Liechtenstein
NO	Norway
CH	Switzerland

EU candidate countries

ME	Montenegro
MK	The former Yugoslav Republic of Macedonia
AL	Albania
RS	Serbia
TR	Turkey

Potential Candidates

BA	Bosnia and Herzegovina
XK	Kosovo ([1])

Units of measurement

%	Per cent
°C	Degree Celsius
EUR	Euro
Mtoe	Million tonnes of oil equivalent
PPS	Purchasing power standards

Abbreviations

AGS	Annual Growth Survey
AMR	Alert Mechanism Report
AROPE	People at risk of poverty or social exclusion
Cedefop	European Centre for the Development of Vocational Training
CIS	Community innovation survey
CO_2	Carbon dioxide
COP	Conference of the Parties
EAPN	European Anti-Poverty Network
ECEC	Early childhood education and care
Eco-IS	Eco-Innovation Scoreboard
EDP	Excessive Deficit Procedure
EEA	European Environment Agency
EED	Energy Efficiency Directive
EFTA	European Free Trade Association
EIT	European Institute of Innovation and Technology
EMU	Economic and Monetary Union
EPO	European Patent Office
ERA	European Research Area
ESD	Effort Sharing Decision
ESS	European Statistical System

([1]) This designation is without prejudice to position or status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

ET 2020	'Education and Training 2020' Framework
ETS	Emissions Trading System
EU	European Union
EU ETS	EU Emission Trading System
EU LFS	EU Labour Force Survey
EU SILC	EU Statistics on Income and Living Conditions
FEAD	Fund for European Aid to the Most Deprived
GDP	Gross domestic product
GHG	Greenhouse gas
GNP	Gross national product
ICT	Information and communications technology
IEA	International Energy Agency
ILO	International Labour Organisation
IPC	International Patent Classification
ISCED	International Standard Classification for Education
LPG	Liquefied petroleum gas
LULUCF	Land use, land-use change and forestry
MIP	Macroeconomic Imbalance Procedure
NACE	Statistical Classification of Economic Activities in the European Community
NB	Nota bene (to be noted)
NEET	Not in education, employment or training
NREAP	National renewable energy action plans
NRP	National Reform Programmes
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organization for Economic Co-operation and Development
PEC	Primary energy consumption
PhD	Doctor of Philosophy
PISA	Programme for International Student Assessment
RED	Renewable Energy Directive
R&D	Research and development
SCP	Stability and Convergence Programme
SDGs	Sustainable Development Goals

SGP	Stability and Growth Pact
STEM	Science, technology, engineering, mathematics
UN	United Nations
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNSC	United Nations Statistical Commission
US	United States
USA	United States of America
VET	Vocational Education and Training

Getting in touch with the EU

In person

All over the European Union there are hundreds of Europe Direct Information Centres. You can find the address of the centre nearest you at: http://europa.eu/contact

On the phone or by e-mail

Europe Direct is a service that answers your questions about the European Union. You can contact this service

— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

— at the following standard number: +32 22999696 or

— by electronic mail via: http://europa.eu/contact

Finding information about the EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: http://europa.eu

EU publications

You can download or order free and priced EU publications from EU Bookshop at: http://bookshop.europa.eu. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see http://europa.eu/contact).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU

The EU Open Data Portal (http://data.europa.eu/euodp/en/data) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

PDF: KS-EZ-17-001-EN-N
Print: KS-EZ-17-001-EN-C

Smarter, greener, more inclusive?

INDICATORS TO SUPPORT THE EUROPE 2020 STRATEGY

The 2017 edition of *Smarter, greener, more inclusive? — Indicators to support the Europe 2020 strategy* continues the series of Eurostat flagship publications providing statistical analyses related to important European Commission policy frameworks and relevant economic, social and environmental phenomena. This publication supports the Europe 2020 strategy by monitoring progress towards the targets and goals defined under the three mutually reinforcing priorities of smart, sustainable and inclusive growth.

The analysis in this publication is based on the Europe 2020 headline indicators chosen to monitor progress towards the strategy's targets. Other indicators focusing on specific subgroups of society or on related contextual issues are also used to deepen the analysis and present a broader picture. The data used mainly come from official European Statistical System sources and are disseminated by Eurostat. The updated 2017 edition covers the period from 2002 or 2008 up to the most recent year for which data are available (2015 or 2016).

For more information
http://ec.europa.eu/eurostat/

PDF: ISBN 978-92-79-70105-4 doi:10.2785/760192
Print: ISBN 978-92-79-70106-1 doi:10.2785/092296