Knowledge for a sustainable Europe

A snapshot from the European Environment Agency

September 2019

25 1994-2019
European Environment Agency

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The EEA and Europe's environment

The overarching challenge of the 21st century is to achieve global sustainability that balances socio-economic, environmental and climate considerations.

Over the past 70 years, advanced economies in Europe and elsewhere in the world have achieved high levels of human development (living well) but at the expense of poor environmental sustainability (not within the environmental limits of the planet). As developing countries catch up economically, this situation is expected to worsen, manifesting itself in increasing climate change, degradation of nature and increased pollution, with manifold impacts on people's health and well-being.

To date, EU legislation has delivered many successes and provides an insurance policy against expected future impacts. Nevertheless, urgent efforts, unprecedented in scale, are required up to 2030 and beyond to tackle Europe's complex sustainability challenges. Addressing them will need policies, investments and knowledge to work together to transform the systems driving unsustainability, while maximising environmental, social and economic co-benefits.

It is in this context that the European Environment Agency (EEA) provides reliable, independent and timely information about Europe's environment to the policymakers and the public by bringing together hundreds of dedicated stakeholders — environment agencies and ministries, public administrations and research organisations — to share knowledge, experience and expertise through its European Environment Information and Observation Network (Eionet).

During the forthcoming EU policy cycle, Europe's policymakers have opportunities to shape future developments that support the building of a resilient, sustainable Europe which is living in harmony with the environment. The EEA and Eionet stand ready to leverage our knowledge and experience to support the transition to a more sustainable future.

The EEA's member countries and cooperating countries

Source: EEA.

Key insights on the challenges for environmental sustainability

CLIMATE CHANGE

- Climate change mitigation
- Adaptation to climate change
- Energy efficiency and renewables

THE NATURAL ENVIRONMENT

- The EU's natural capital
- Halting biodiversity loss
- Water in the economy

POLLUTION AND HEALTH

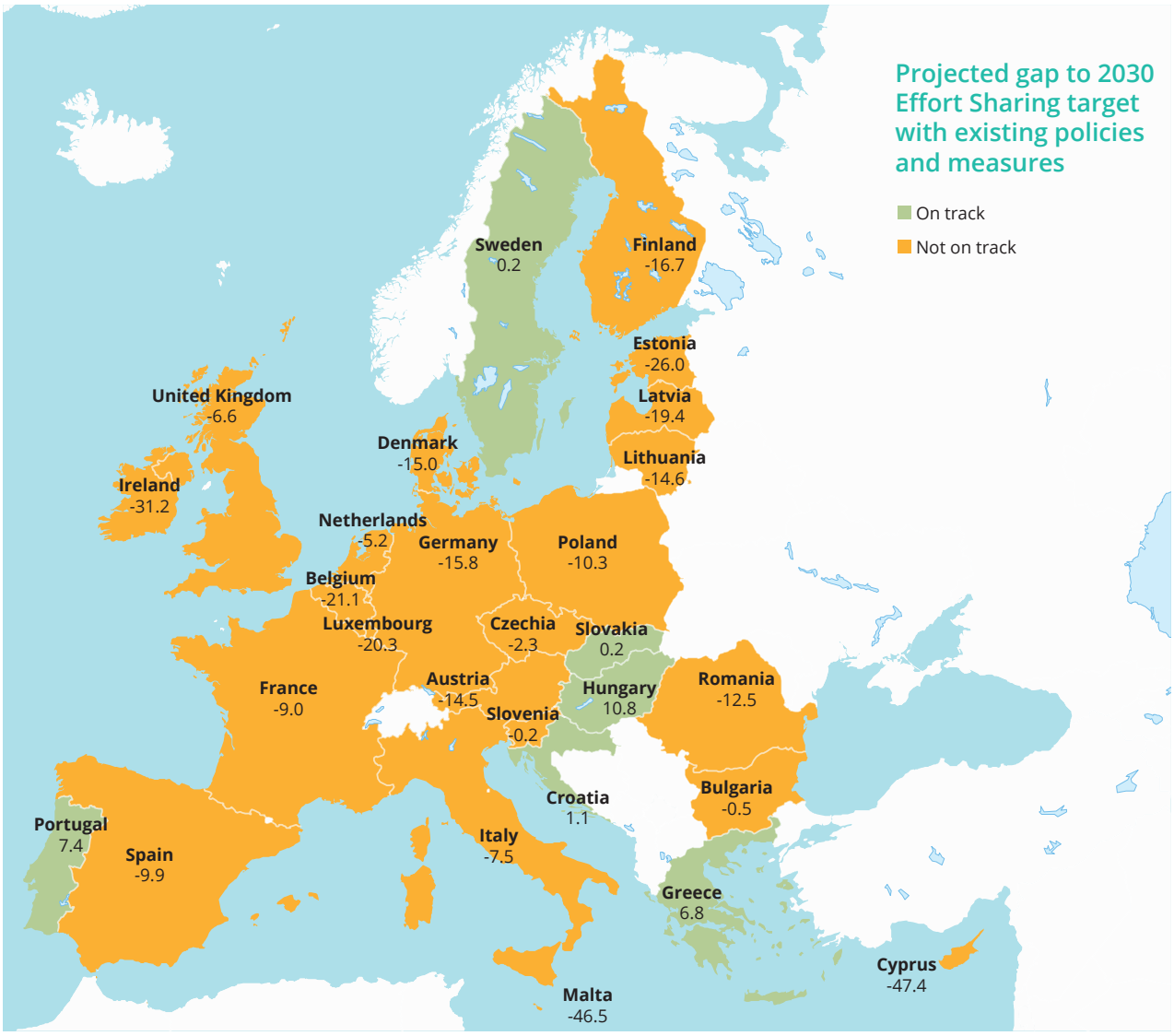
- Environment and health
- Air pollution
- Chemical pollution

CLIMATE CHANGE

Climate change mitigation

Several climate variables, including global and European temperatures and sea level, have repeatedly broken long-term records in recent years. EU mitigation efforts have contributed to cutting greenhouse gas emissions. Greenhouse gas emissions were cut by almost one quarter since 1990, due to improvements in energy efficiency and the increased use of renewable energy sources. Transport remains one of the biggest challenges for decarbonising the economy. For 2030, the EU has set targets to achieve a 40 % reduction in greenhouse gas emissions. Based on the current policies and measures and projections reported by Member States, the EU is not on track to achieve these targets. Reaching the EU's target of an 80-90 % reduction by 2050 will require substantial reduction efforts, including rapidly accelerating energy efficiency and the use of renewables in the energy mix, maximising the potential of technological and circular economy options, establishing land-based carbon sinks and transforming mobility patterns.

Projected progress of EU Member States towards their 2030 climate targets



Source: EEA, 2018, *Trends and Projections in Europe 2018: tracking progress towards Europe's climate and energy targets,* EEA Report No. 16/2018.

Adaptation to climate change

All European regions are vulnerable to climate change but its impact varies from one region to another. With the aim of enhancing Europe's preparedness to respond to climate change, at both local and Europeans levels, climate change adaptation is increasingly mainstreamed in EU policies. In fact, most EU Member States have adopted national adaptation strategies. Furthermore, an increasing number of cities are adopting local adaptation strategies.

The EU is broadly on track to achieve the target of spending at least 20 % of its budget for 2014-2020 on climate-related actions, and further efforts are anticipated in the EU Multiannual Financial Framework 2021-2027. Efforts to date show a shift in climate-related spending in some EU policy areas (such as the European Regional Development Fund and the Cohesion Fund) but not in others (such as agriculture, rural development and fisheries).

Observed and projected climate change impacts for the main regions in Europe

Arctic region
- Temperature rise much larger than global average
- Decrease in Arctic sea ice coverage
- Decrease in Greenland ice sheet
- Decrease in permafrost areas
- Increasing risk of biodiversity loss
- Some new opportunities for the exploitation of natural resources and for sea transportation
- Risks to the livelihoods of indigenous peoples

Coastal zones and regional seas
- Sea level rise
- Increase in sea surface temperatures
- Increase in ocean acidity
- Northward migration of marine species
- Risks and some opportunities for fisheries
- Changes in phytoplankton communities
- Increasing number of marine dead zones
- Increasing risk of water-borne diseases

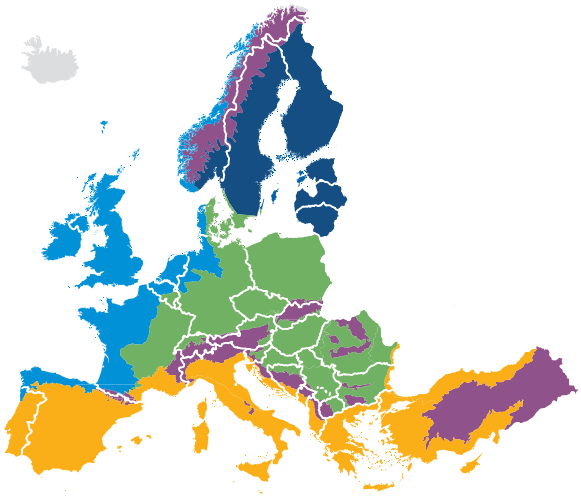
Atlantic region
- Increase in heavy precipitation events
- Increase in river flow
- Increasing risk of river and coastal flooding
- Increasing damage risk from winter storms
- Decrease in energy demand for heating
- Increase in multiple climatic hazards

Boreal region
- Increase in heavy precipitation events
- Decrease in snow, lake and river ice cover
- Increase in precipitation and river flows
- Increasing potential for forest growth and increasing risk of forest pests
- Increasing damage risk from winter storms
- Increase in crop yields
- Decrease in energy demand for heating
- Increase in hydropower potential
- Increase in summer tourism

Mountain regions
- Temperature rise larger than European average
- Decrease in glacier extent and volume
- Upward shift of plant and animal species
- High risk of species extinctions
- Increasing risk of forest pests
- Increasing risk from rock falls and landslides
- Changes in hydropower potential
- Decrease in ski tourism

Continental region
- Increase in heat extremes
- Decrease in summer precipitation
- Increasing risk of river floods
- Increasing risk of forest fires
- Decrease in economic value of forests
- Increase in energy demand for cooling

Mediterranean region
- Large increase in heat extremes
- Decrease in precipitation and river flow
- Increasing risk of droughts
- Increasing risk of biodiversity loss
- Increasing risk of forest fires
- Increased competition between different water users
- Increasing water demand for agriculture
- Decrease in crop yields
- Increasing risks for livestock production
- Increase in mortality from heat waves
- Expansion of habitats for southern disease vectors
- Decreasing potential for energy production
- Increase in energy demand for cooling
- Decrease in summer tourism and potential increase in other seasons
- Increase in multiple climatic hazards
- Most economic sectors negatively affected
- High vulnerability to spillover effects of climate change from outside Europe



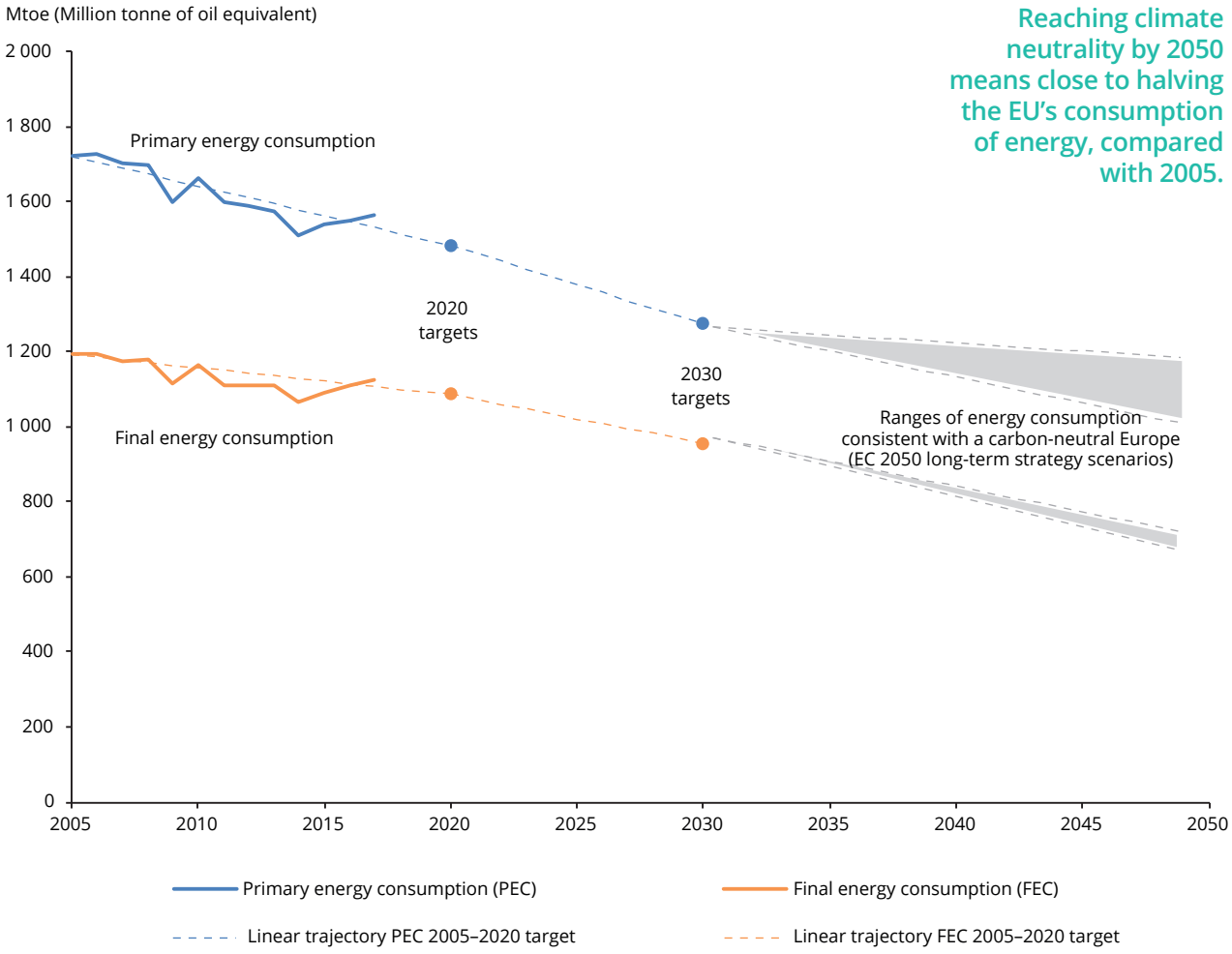
Source: EEA, 2017, Climate change, impacts and vulnerability in Europe 2016 – An indicator-based report, EEA Report No. 1/2017.

Energy efficiency and renewables

Decreasing trends in energy consumption have been reversed since 2014, driven by economic growth and increasing energy use by households. Recent policy developments (e.g. on energy performance on buildings) can accelerate energy efficiency improvements if fully implemented. Nevertheless, reaching climate neutrality would mean halving the EU's consumption of energy, compared with 2005, and having an energy system driven only by renewable sources.

The EU has steadily increased the share of renewable energy. The higher the contribution from renewables, the easier it is to break the link between economic growth, energy use and emissions. Further growth in the share of renewable energy will depend on the full implementation of existing and new policy frameworks to attract investments in renewables and reverse the trend of increasing EU energy consumption.

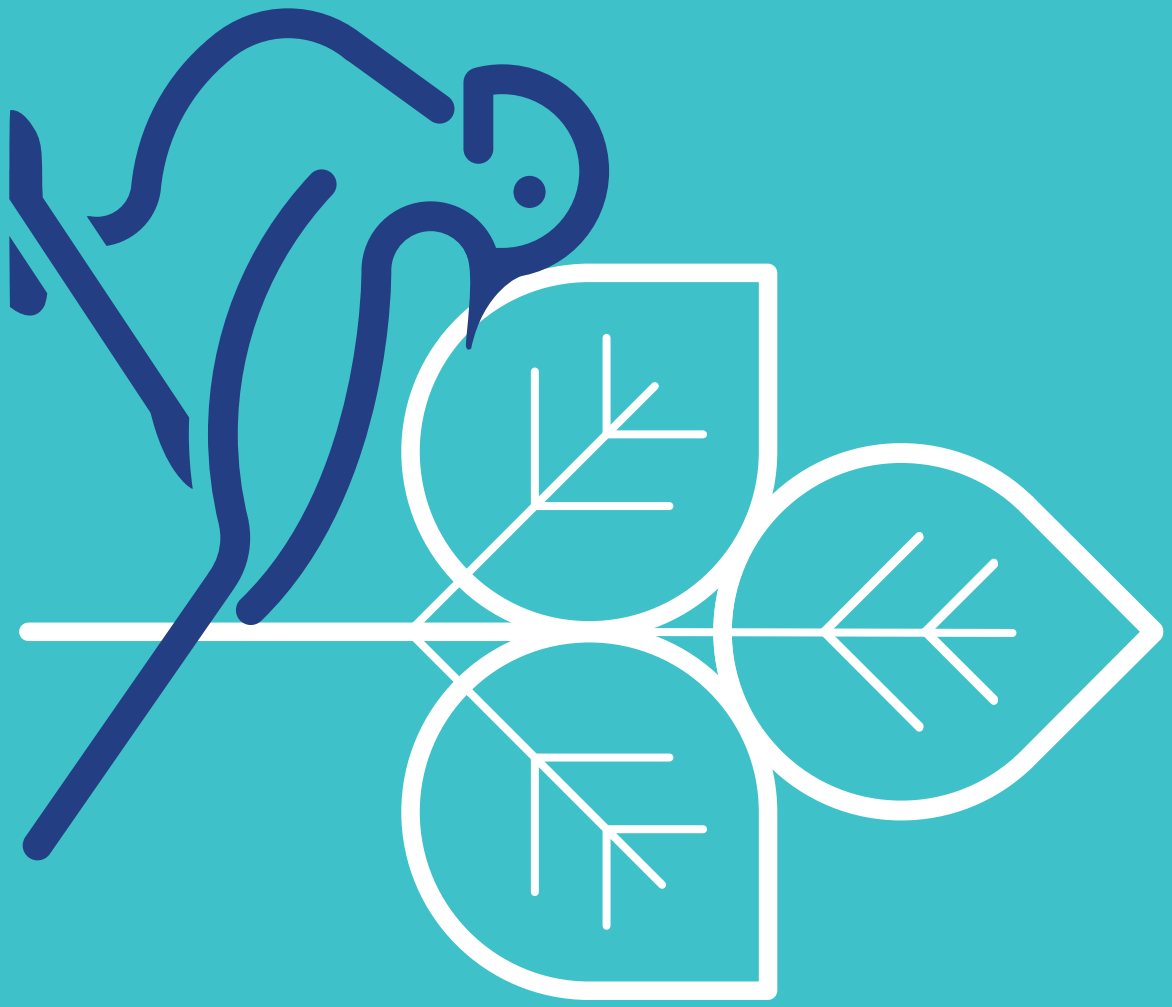
Actual and projected primary and final energy consumption in the EU, 2005-2050



Reaching climate neutrality by 2050 means close to halving the EU's consumption of energy, compared with 2005.

Note: Primary energy consumption covers the consumption of the energy sector itself, the losses during the transformation and distribution of energy and the final energy consumption. Final energy consumption covers consumption by end users (e.g. households, industry, services, agriculture) once the energy has been delivered to them.

Source: EEA, 2019, updated from *Trends and Projections in Europe 2018: tracking progress towards Europe's climate and energy targets*, EEA Report No. 16/2018.



THE NATURAL ENVIRONMENT

The EU's natural capital

Biodiversity, the fabric of life, is a fundamental component of natural capital and essential to human well-being, as it delivers services that sustain our economies and societies. However, the EU's natural capital is not yet being protected, maintained and enhanced in line with EU ambitions. Natural capital continues to be degraded by habitat loss and fragmentation, climate change, pollution, overexploitation of natural resources and invasive alien species.

The broad framework of EU biodiversity policy remains fit for purpose. It can be enhanced by effectively implementing and funding existing measures, by wider application of ecosystem-based management approaches for agriculture, forestry and maritime activities. Increasing public awareness of its intrinsic value for society through nature-based solutions is as important as its fundamental underpinning of societal resilience and economic development.

The EEA's scoreboard: Outlook for the EU's natural environment

	EU indicator past trend	Outlook for meeting the selected objective by 2020
Exposure of terrestrial ecosystems to eutrophication due to air pollution	▲	●
Gross nutrient balance in agricultural land: nitrogen	▲	●
Land take	▲	●
Forest: growing stock, increment and fellings	▲	●
Status of marine fish and shellfish in European seas	▲	●
Abundance and distribution of selected species (common birds and grassland butterflies)	▲	●
Species of European interest	▲	●
Habitats of European interest	▲	●
Status of surface waters	▲	●

EU indicator past trend	Outlook for the EU meeting the selected objective by 2020
▲ Improving trend	● It is likely that the objective will be met by 2020
▲ Stable or unclear trend	● It is uncertain whether or not the objective will be met by 2020
▲ Deteriorating trend	● It is unlikely that the objective will be met by 2020

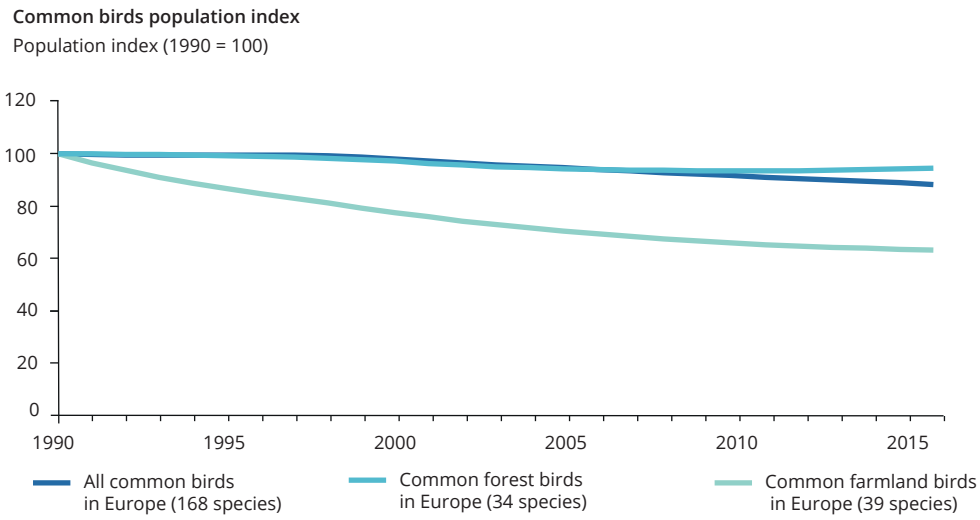
Source: EEA, 2018, *Environmental indicator report 2018 – in support to the monitoring of the Seventh Environment Action Programme,* EEA Report No. 19/2018.

Halting biodiversity loss

Over 25 years, common birds and grassland butterfly species, both representative indicators of biodiversity and the general health of ecosystems, have shown declining trends, pointing to a major decline in biodiversity in Europe. Major causes include agricultural intensification, intensive forest management, land abandonment and urban sprawl. The main drivers of the decline in grassland butterflies are agrochemical use and abandonment of grasslands.

Signs of stress are also observed by changes in Europe's seas, such as changes and loss of species and habitats and the degradation of marine and coastal ecosystems. The major policy challenge is to achieve wide and effective deployment of the conservation measures designed to help populations recover at national and European levels in EU policies such as the Birds and the Habitats Directives, the Water Framework Directive, the Marine Framework Directive and the Common Agricultural Policy (CAP).

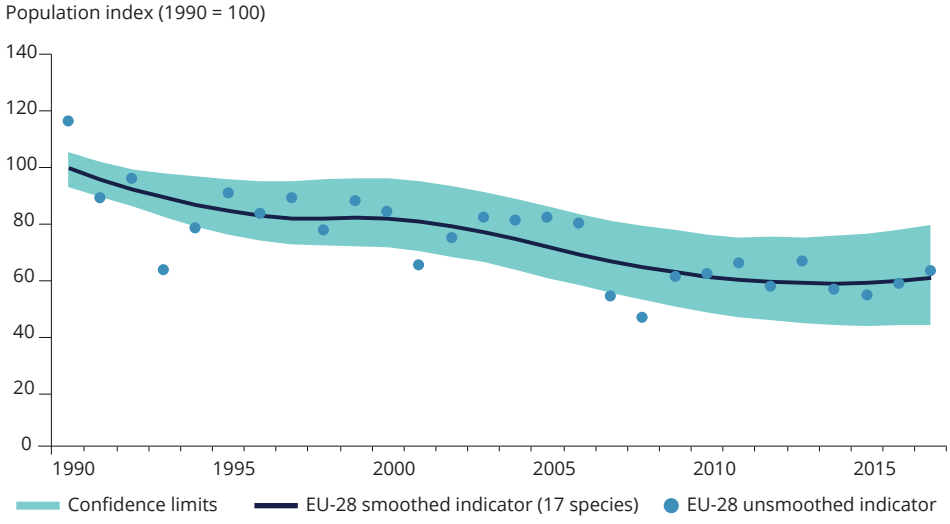
Long-term trends in common bird species in the EU, 1990-2016



Between 1990 and 2016, there was a 9 % decrease in the index of common birds in the 26 EU Member States with bird population monitoring schemes

Source: EEA, 2019, *Common birds - population index, 1990-2016* (*SEBI 001, CSI 050).*

Long-term trends in grassland butterfly species in the EU, 1990-2017



Between 1990 and 2017, there was a 39 % decrease in the index of grassland butterflies in the 15 EU Member States with butterfly monitoring schemes

Source: EEA, 2019, *Grassland butterflies – population index*, 1990-2017 (*SEBI 001, CSI 050).*

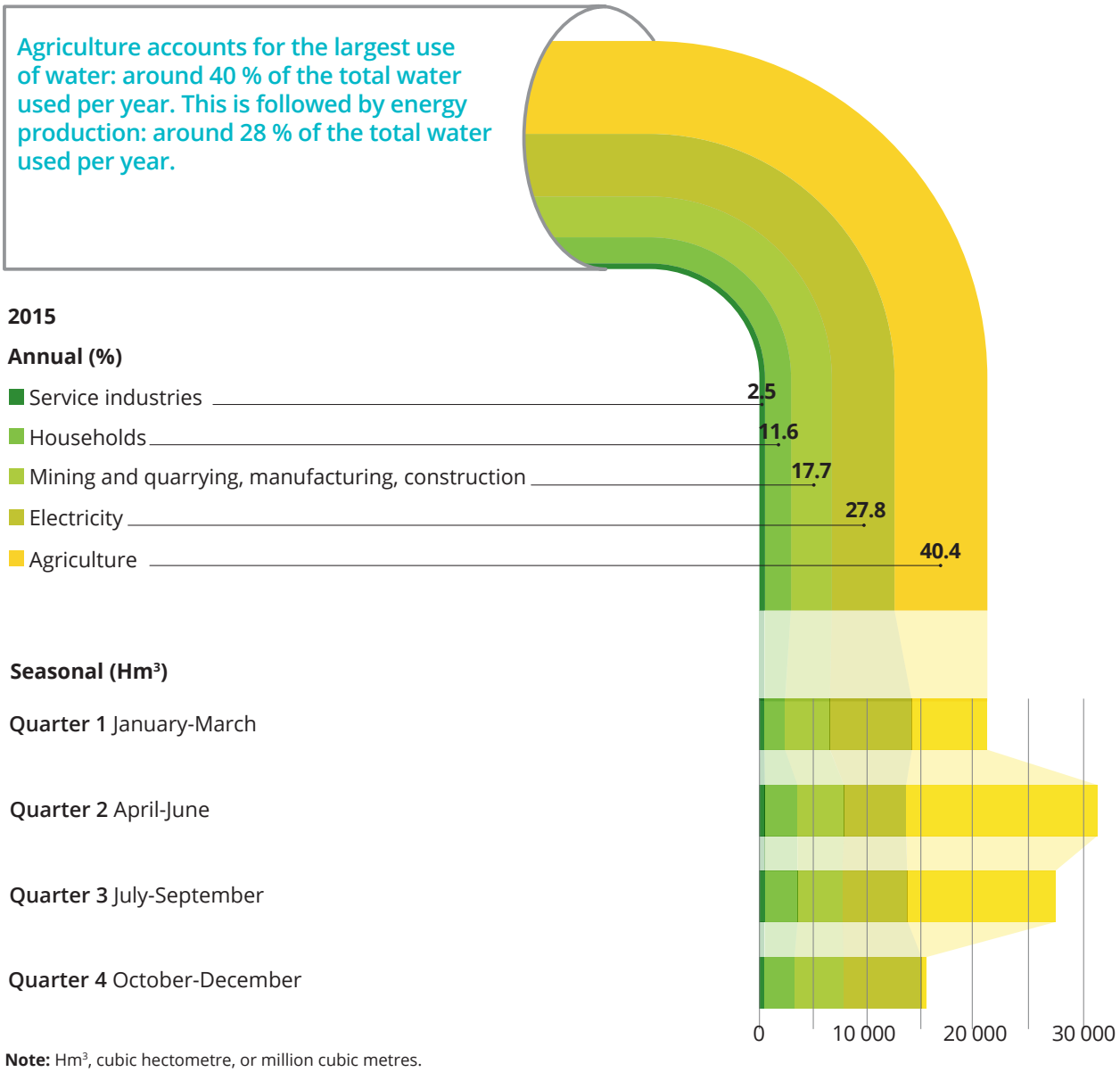
Water in the economy

Water is essential for the industrial economy, agriculture and households. According to the EEA's water exploitation index, economic activities in Europe use on average 243 000 million cubic metres of water on an annual basis. Climate change is expected to exacerbate shortages in the coming decades in southern parts of Europe. Although most of this water is returned to the environment, it often contains impurities or pollutants, including hazardous chemicals.

Over the past 30 years, thanks to EU legislation, the quality of Europe's freshwater bodies have improved. But only around 40 % of surface waters (rivers, lakes and transitional and coastal waters) are in good ecological status or potential, and only 38 % are in good chemical status. Further improvements in quantity and quality will require increased coherence between EU water policy objectives and measures. An ecosystem based approach could further support progress.

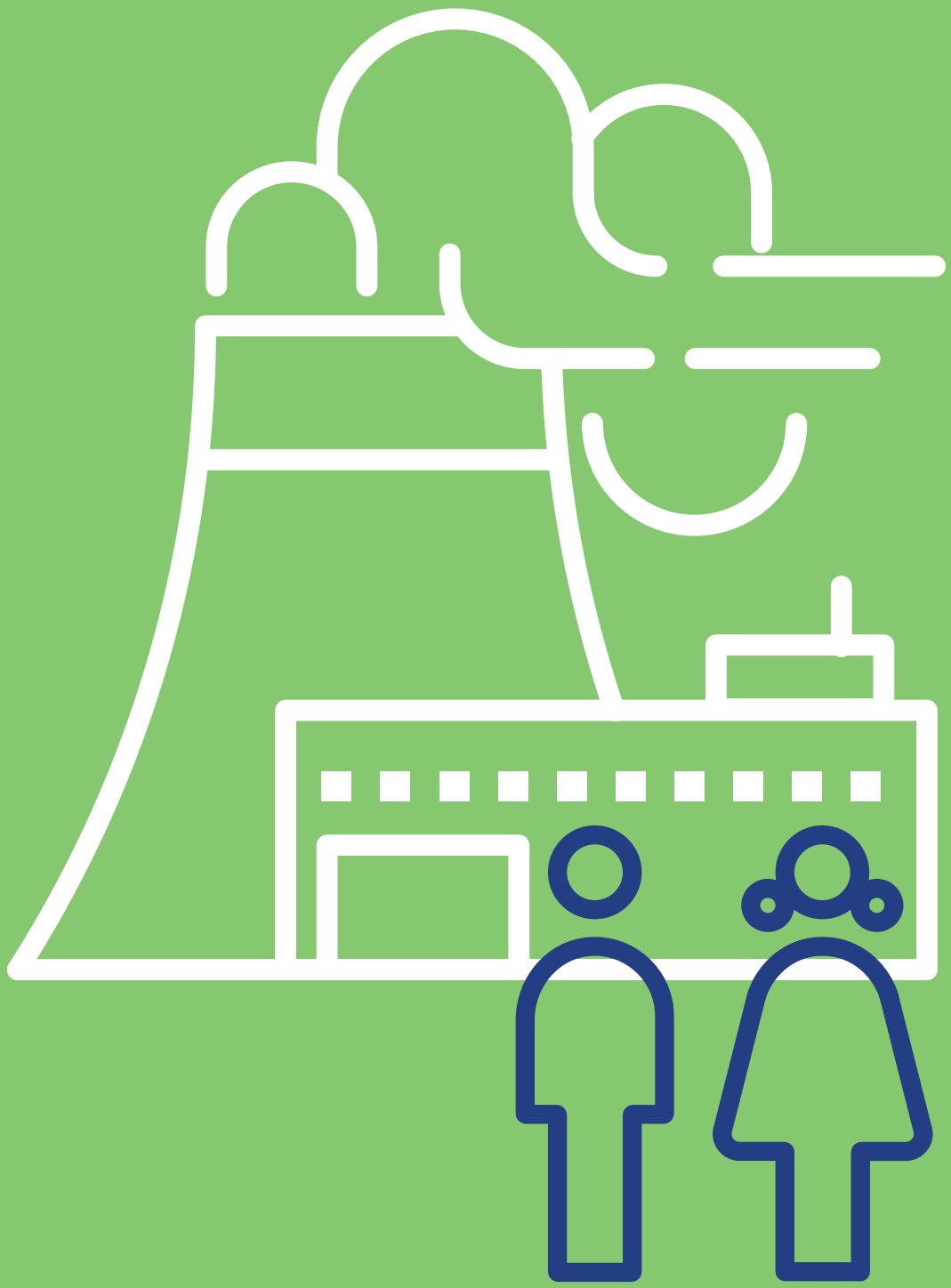
Water use by sector in the EU, 2015

Agriculture accounts for the largest use of water: around 40 % of the total water used per year. This is followed by energy production: around 28 % of the total water used per year.



Note: Hm^3, cubic hectometre, or million cubic metres.
Source: EEA, 2018, EEA *Signals 2018 – Water is life.*

POLLUTION AND HEALTH



Environment and health

Good quality natural environments are essential for health and well-being, in terms of clean air and water, fertile land for food production, and energy and material inputs. At the same time, people are exposed to mixtures of chemicals from consumer products and through contaminated water, food, air and soil, which affects their own health and potentially that of future generations.

A growing body of evidence suggests that environmental pollution disproportionally affects socially disadvantaged and vulnerable population groups, as they face practical constraints on avoiding environmental risks. They may also be more sensitive to the impacts of environmental pollution, due to pre-existing health conditions, poor nutritional status and specific behaviours.

The EEA's scoreboard: Outlook for the EU's environment and health

	EU indicator past trend	Outlook for meeting the selected objective by 2020
Exceedance of air quality standards in urban areas (nitrogen dioxide: NO_2; dust particles: PM_{10}; fine particulate matter: $PM_{2.5}$; ozone: O_3)	▲ NO_2, PM_{10}, $PM_{2.5}$ ▲ O_3	●
Emissions of the main air pollutants in Europe (sulphur oxides: SO_2; nitrogen oxides: NO_X; fine particulate matter: $PM_{2.5;}$ non-methane volatile organic compounds: NMVOCs; ammonia: NH_3)	▲ SO_2, NO_X, $PM_{2.5,}$ NMVOCs ▲ NH_3	● SO_2, NO_X, $PM_{2.5}$ NMVOCs ● NH_3
Bathing water quality	▲	●
Number of countries that have adopted a climate change adaptation strategy and/or plan	N.A.	●
Exposure to environmental noise	▲	●
Consumption of chemicals, by hazard class	▲	●
Total sales of pesticides	▲	●

EU indicator past trend	Outlook for the EU meeting the selected objective by 2020
▲ Improving trend	● It is likely that the objective will be met by 2020
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▲ Deteriorating trend	● It is unlikely that the objective will be met by 2020

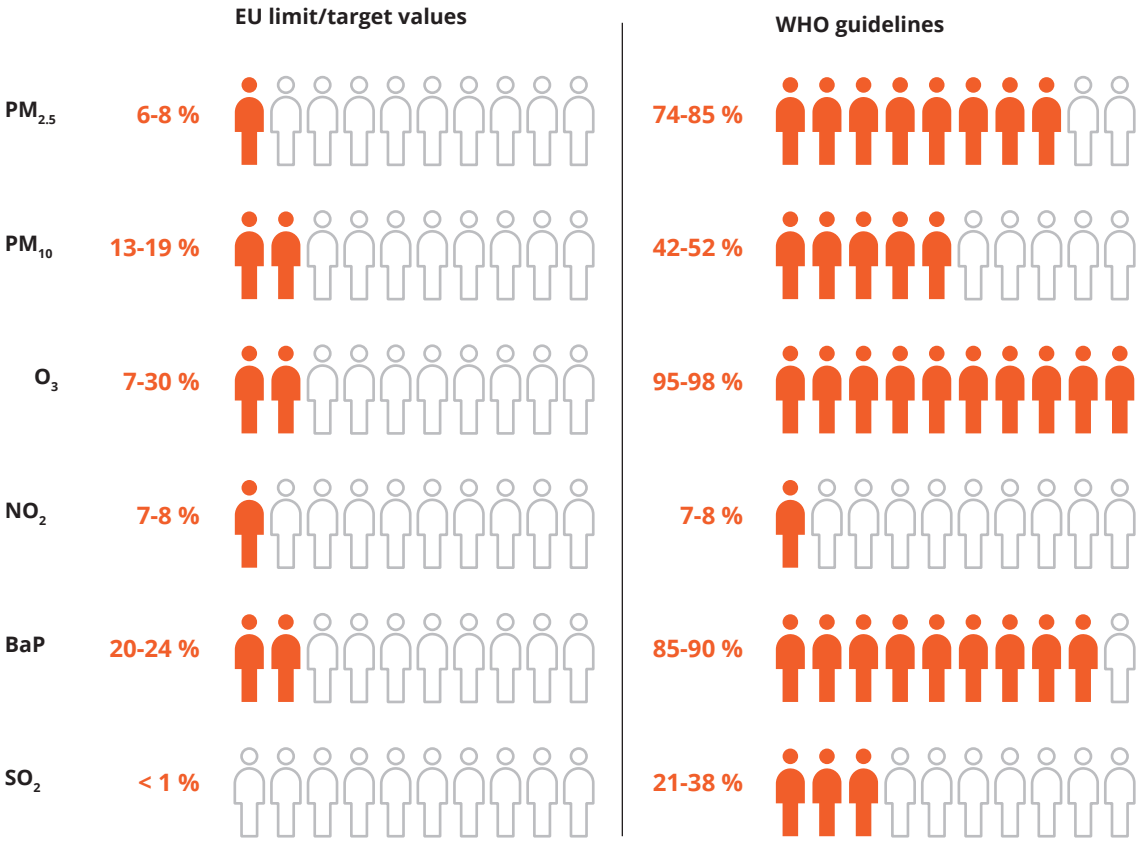
Source: EEA, 2018, *Environmental indicator report 2018 – In support to the monitoring of the Seventh Environment Action Programme*, EEA Report No. 19/2018.

Air pollution

Exposure to air pollution accounts for an estimated 400 000 premature deaths in Europe every year. A significant proportion of the urban population in the EU remains exposed to concentrations of certain air pollutants above EU limit values and many more in relation to the more stringent World Health Organization (WHO) values. In fact, around 85 % of city dwellers in Europe are exposed to fine particulate matter (PM2.5), which is estimated to reduce average life expectancy in the EU by more than 8 months.

EU air pollution policies have driven down emissions of many air pollutants in Europe over recent decades, resulting in a general improvement in the air quality across the region. Improved implementation of existing EU policies, as well the introduction of more ambitious measures closer to the WHO recommended levels would garner substantial public support.

Proportions of the EU urban population exposed to air pollutant concentrations above WHO guidelines



Note: $PM_{2.5}$, fine particulate matter; PM_{10}, coarse particulate matter; O_3, ozone; NO_2, nitrogen dioxide, BaP, benzo[a]pyrene; SO_2, sulphur dioxide.

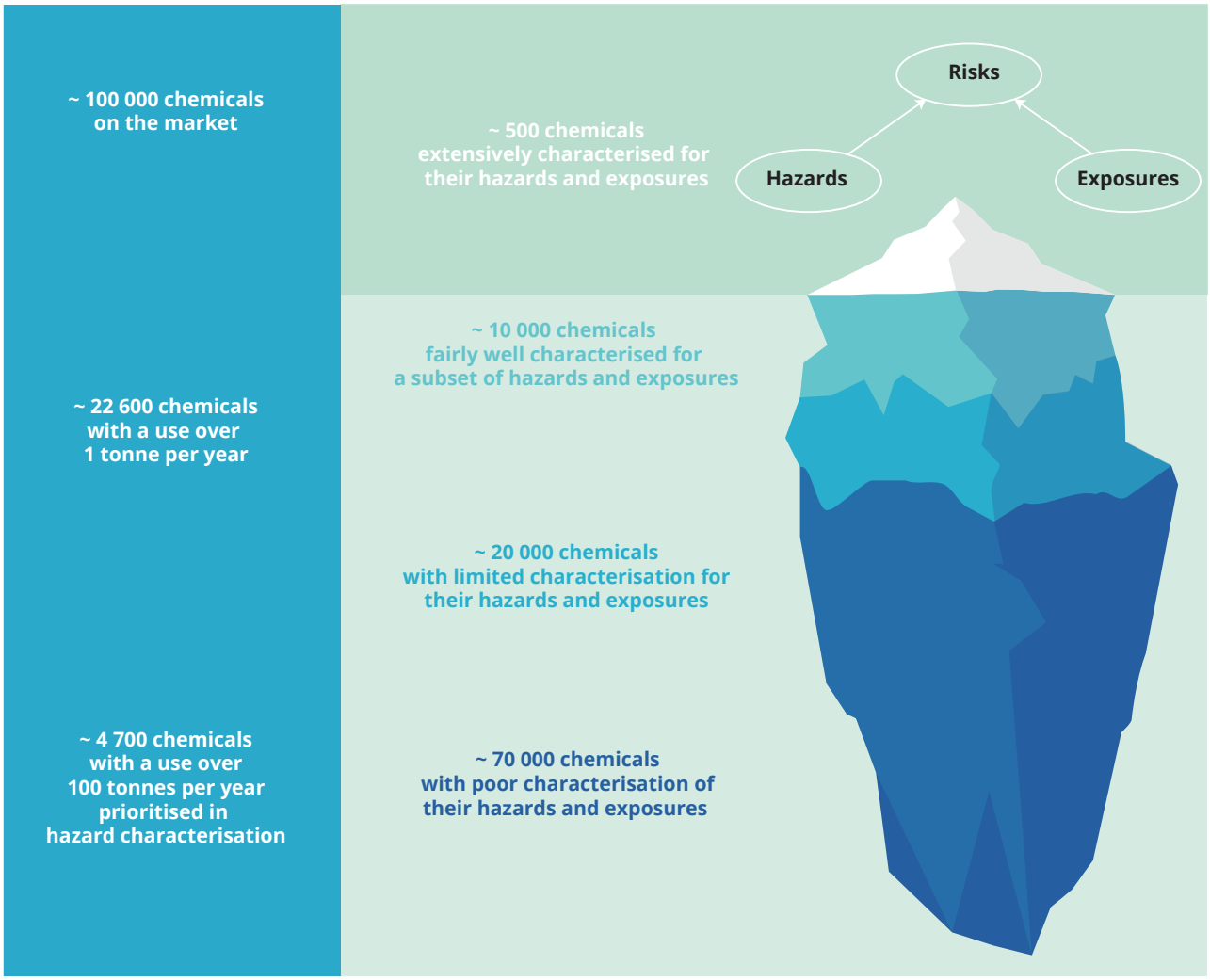
Source: EEA. *Air quality in Europe — 2018 report*, EEA Report No. 12/2018.

Chemical pollution

Industrialised economies are highly dependent on chemicals. Chemical products (e.g. pharmaceuticals, plastics and fertilisers) are ever-present in society and in the environment. EU policies have successfully reduced acute and visible chemical pollution over decades. However, projected increases in chemical use are expected to exacerbate their negative impact on people's health and life expectancy, as well as reduce ecosystem resilience.

The variety and volume of chemicals used in Europe makes it impossible to carry out chemical-specific risk assessments. Tackling chemical groups rather than single substances offers opportunities to accelerate risk management. Knowledge gaps on the health impacts from chemicals need to be addressed through innovative human biomonitoring. Tighter controls on the use of hazardous chemicals and promoting chemicals that are safe-by-design can also spur innovation, investments and jobs.

Chemical use in the EU



Source: EEA.

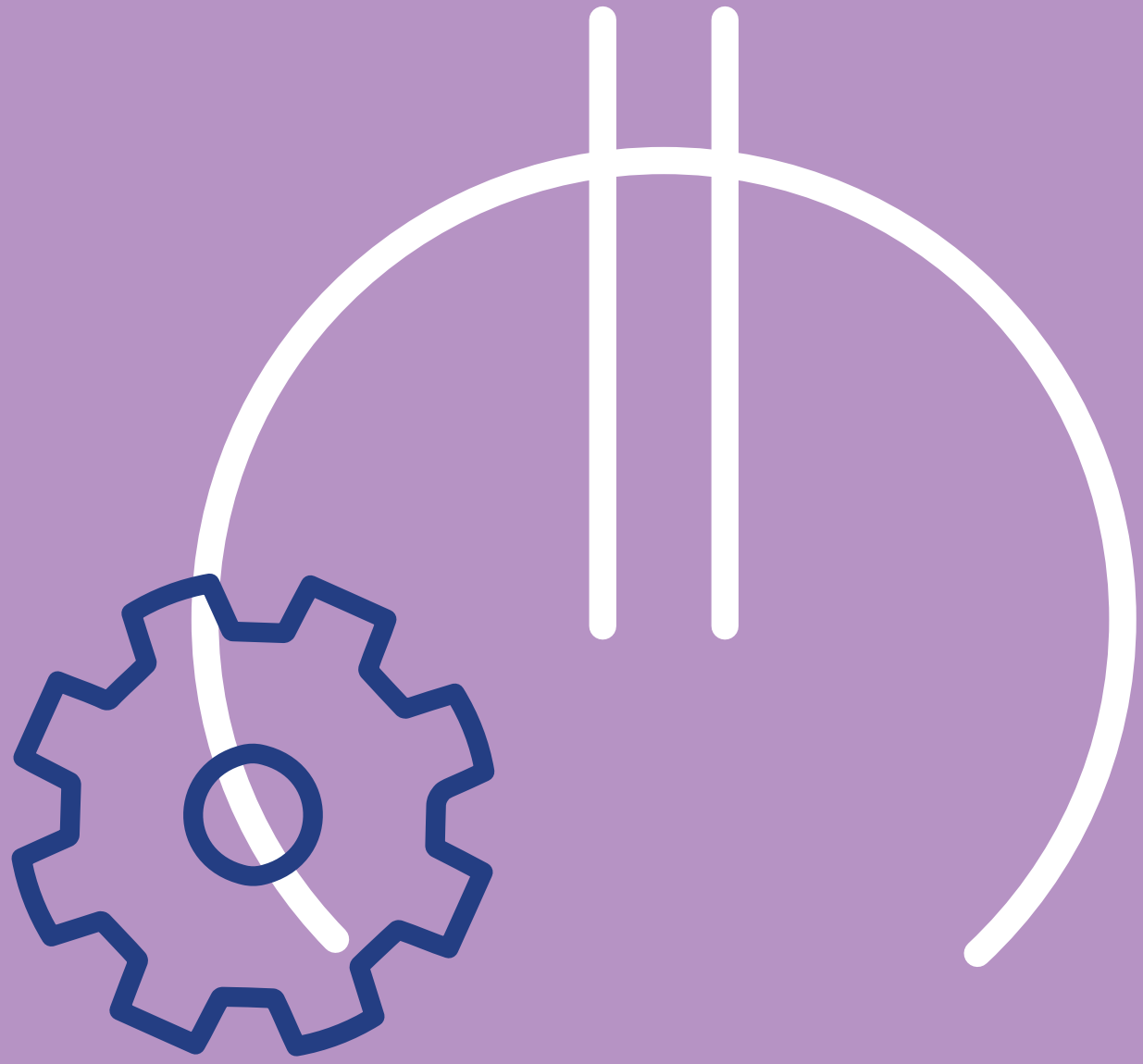
Harnessing innovation for sustainable development

SUSTAINABLE DEVELOPMENT

- Towards sustainable development
- Resource efficiency
- Food systems

ENABLING SUSTAINABILITY TRANSITIONS

- Promoting innovation
- Paying for transitions
- Embracing sustainable development



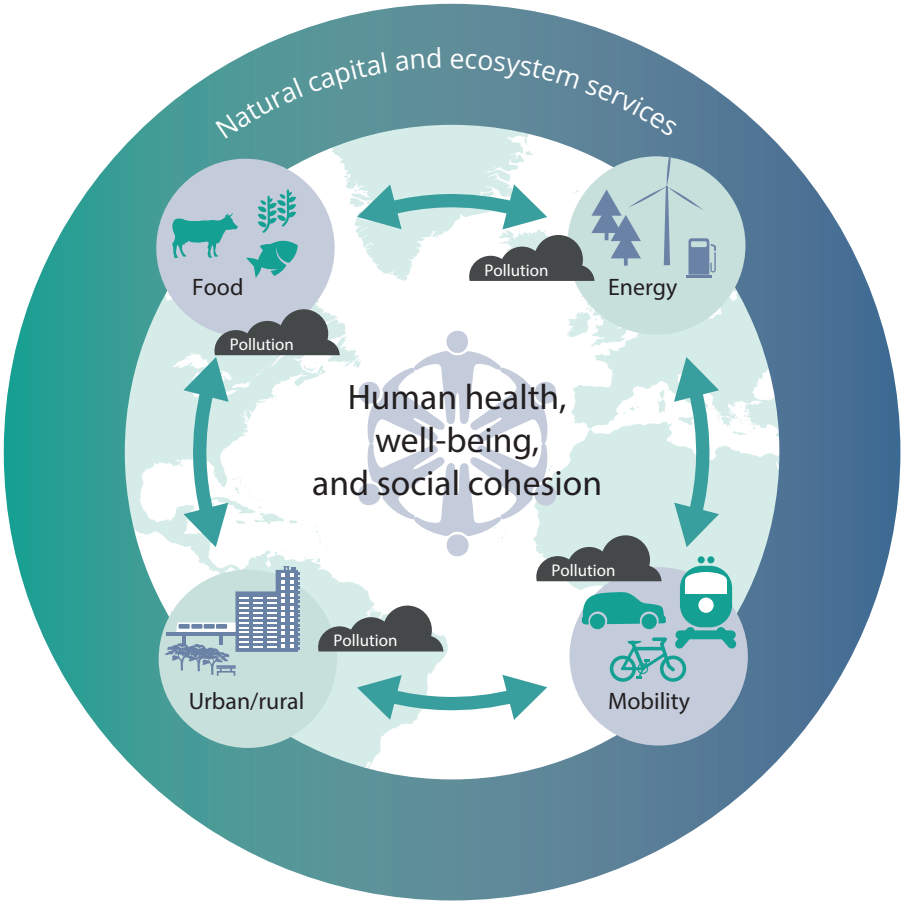
SUSTAINABLE DEVELOPMENT

Towards sustainable development

The EU has achieved unprecedented levels of prosperity and well-being. However, today, it needs to achieve urgent and fundamental changes in its core systems of production and consumption to achieve sustainable development. This need is increasingly crystallising into a focus on three particular systems - the energy, mobility and food systems - and how these relate to where people live in urban and rural settings.

These three systems are linked both directly and indirectly, so that changes in one system can have positive and negative knock-on effects in other systems. This is because, *inter alia,* the three share a reliance on fossil fuels, which drive climate change and chemical pollution, and on natural systems, as both a source of resources and a sink for waste and emissions, and they are tightly interwoven into the socio-economic fabric of how we live in the EU.

Interactions between ecosystems and production-consumption systems



- European societies' cohesion, well-being and economic performance are highly dependent on natural capital.
- Sustained actions are needed to address human health impacts and natural capital degradation.
- Transitions to sustainability for food, energy, mobility and urban systems should be the focus for such actions.
- Such transitions can be accelerated by fiscal and finance policies that support environment and climate objectives and take account of Europe's ageing society.
- The UN 2030 agenda and SDGs offer a framework for more ambitious European actions globally.

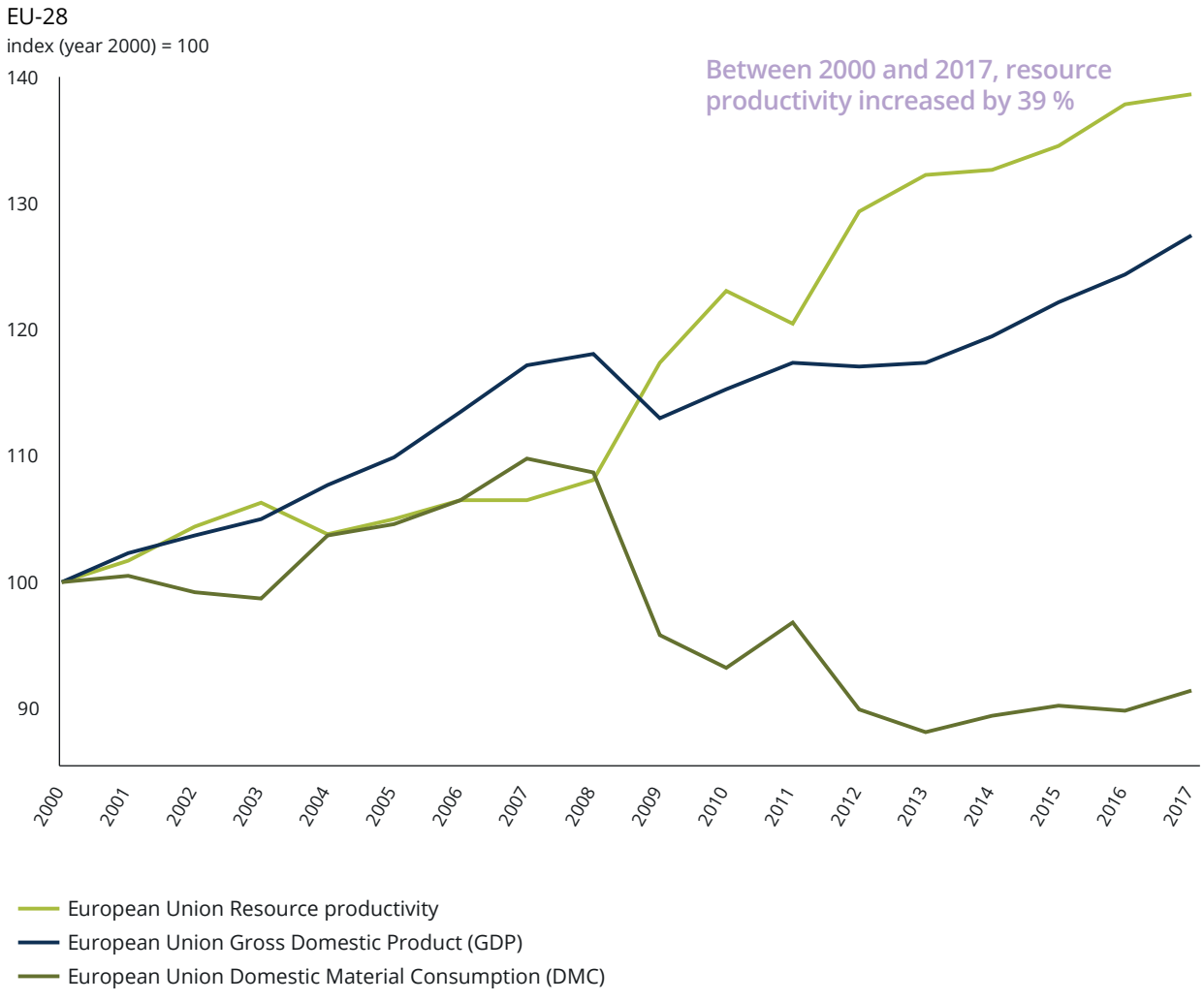
Note: SDGs, Sustainable Development Goals.
Source: EEA.

Resource efficiency

Resource efficiency is one of the core elements necessary to create a sustainable economy in Europe and further afield, alongside more sustainable production and consumption patterns. Resource extraction is behind 50% of greenhouse gas generation and 90% of biodiversity loss on a global scale. Consumption patterns in Europe are a significant driver of these trends.

Current EU policy initiatives on the circular economy, climate neutral economy and bioeconomy show the direction to take to achieve a sustainable economy in Europe. Bringing them together would enhance efforts to address climate change, natural capital, resource use and human well-being objectives simultaneously. Overall, the EU appears to be extracting more value from the material resources it uses.

Trends in resource productivity, resource consumption (DMC) and gross domestic product (GDP) in the EU Member States (EU-28), 2000-2017



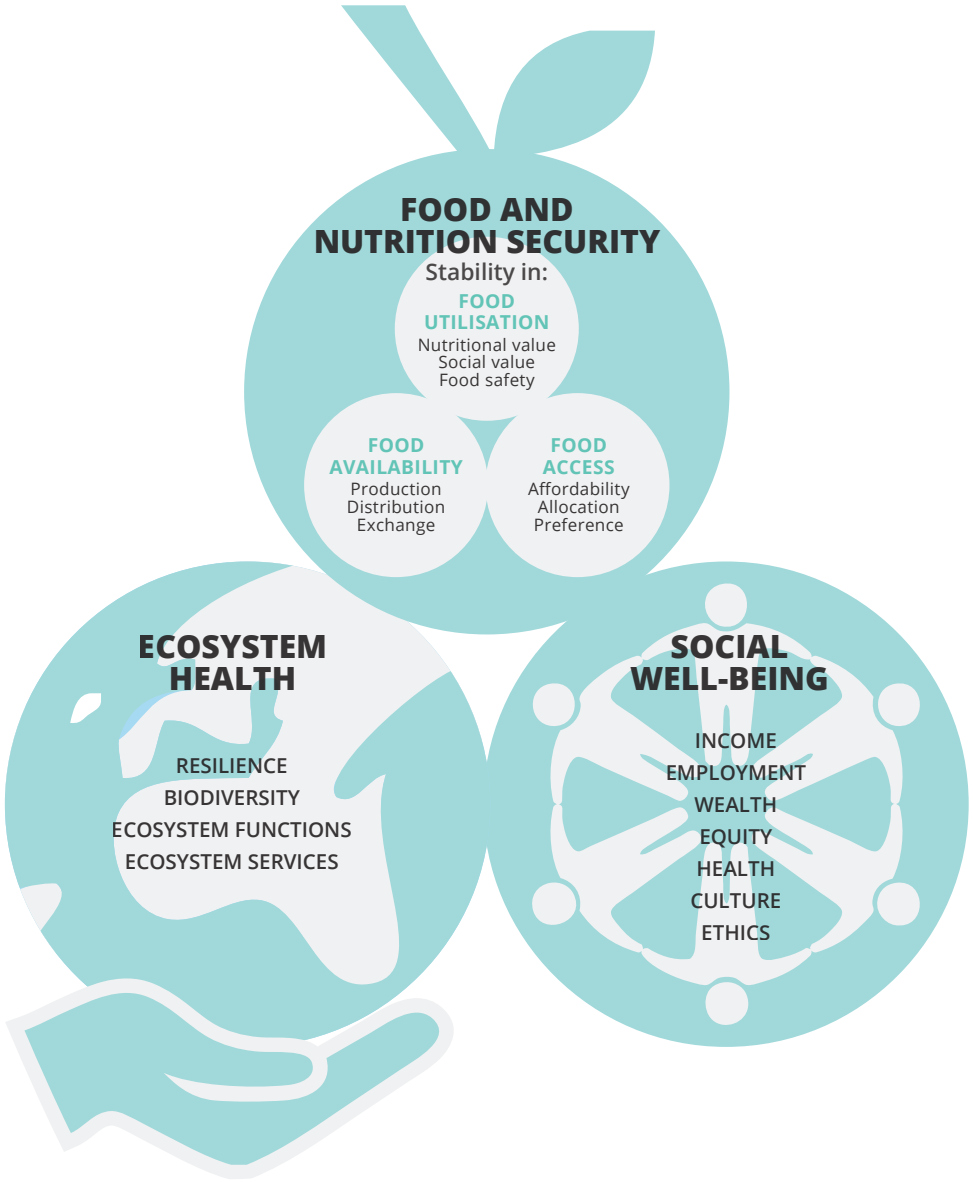
Source: EEA, 2018, *Environmental indicator report 2018 – in support to the monitoring of the Seventh Environment Action Programme*, EEA Report No. 19/2018.

Food systems

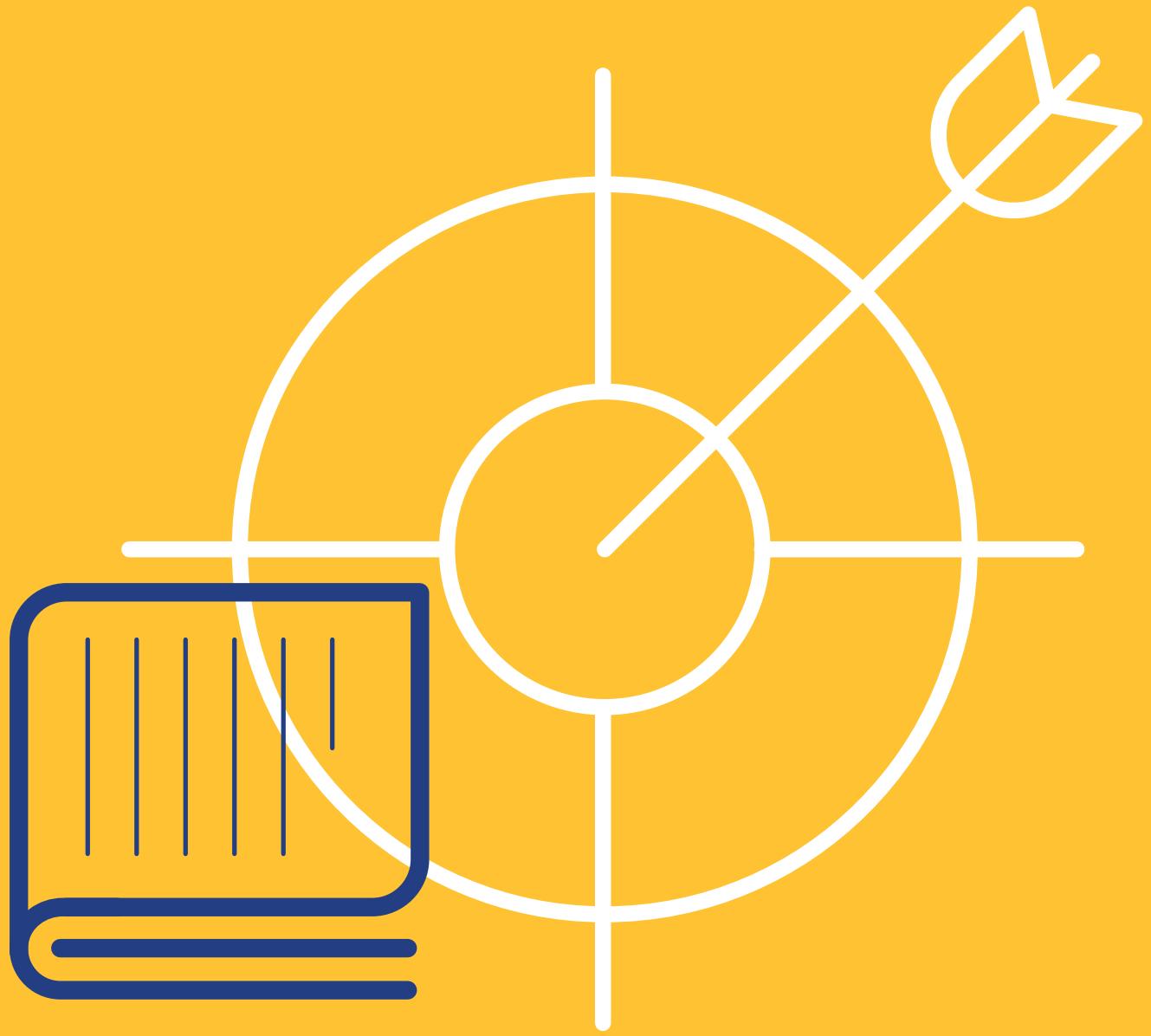
The food system is characterised by large diversity in Europe, because of variations in climate, morphology and diversity of soils, landscapes and seascapes and of socio-economic conditions, technical skills and levels of investment. In addition to meeting various societal needs, the food system is responsible for a vast array of impacts on the environment through emissions of pollutants, depletion of resources, biodiversity loss and degradation of ecosystems, in Europe and beyond.

Overall, progress towards sustainable outcomes in the food system is still limited. But, there are opportunities to make it more sustainable by changing production practices, changing dietary habits and behaviour, and reducing food waste. Developing a common policy framework for the food system could also turn into a fundamental enabler for system change and transitions to sustainability by realigning sectoral polices across production, processing, distribution and consumption.

Achieving sustainable outcomes in the food system



Source: EEA, based on Ingram, 2011 and UNEP, 2016.



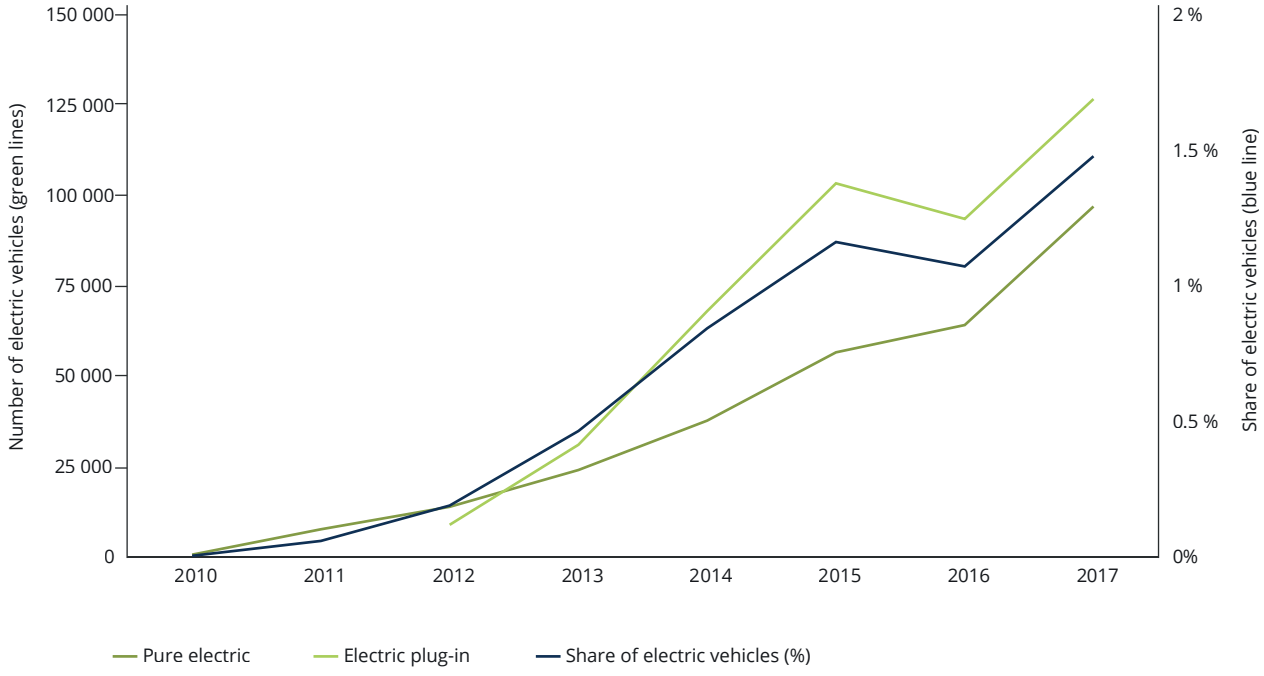
ENABLING SUSTAINABILITY TRANSITIONS

Promoting innovation

Transitions involve changes across society. Governments have a key role in stimulating and guiding the direction of change and in reducing the many barriers to transitions. Novel social practices, technologies and business models are the core innovations that can drive systemic change. A diversity of ideas and approaches is important because the viability and sustainability impacts of individual innovations are very hard to anticipate in advance.

Communities and businesses are experimenting with new ways of living and working. Governments should harness these initiatives and drive upscaling by supporting social and technological innovation, promoting ecosystem-based management approaches, enabling new ways of networking, engaging stakeholders in governance, and ensuring socially fair transitions.

Trends in new electric vehicles in the EU, 2010-2017



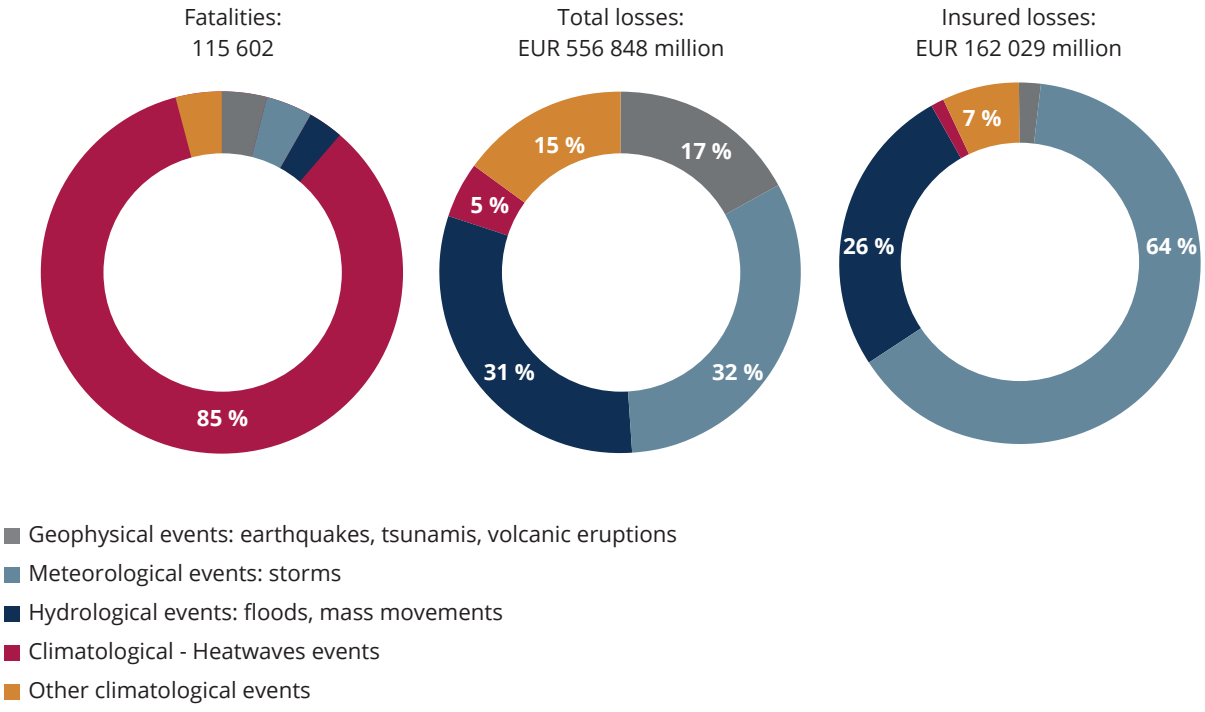
Compared with 2016, sales of battery electric vehicles (BEVs) in the EU increased by 51% in 2017. But, BEVs continue to constitute only a small fraction of new vehicle registrations.

Source: EEA, 2018, *Electric vehicles as a proportion of the total fleet* (*TERM 034*).

Paying for transitions

The scale of financial resources needed to effect sustainability transitions is daunting. The costs of inaction may be even greater. It is estimated that about EUR 1 trillion worth of investment is needed, annually, from 2021 onwards, to meet the EU's 2030 climate and energy targets. These are also productive investments with expected returns and multiple co-benefits.
Various sources of finance can contribute, including venture capital, business angels, crowdfunding and blockchain funding. Yet it is doubtful that these sources alone will ensure the large-scale, long-term and targeted investment needed, hence the importance of the EU sustainable finance initiative. Fiscal reform policies focused on consumption can also help efforts to shift EU economies towards becoming greener and more resource efficient and socially inclusive.

Economic losses from climate-related extremes in the EU Member States, 1980-2017



Source: EEA, 2019, *Economic losses from climate-related extremes in Europe* (*CSI042, CLIM039*).

Embracing sustainable development

Achieving sustainability transitions will depend on coherent contributions across all policy domains. Beyond full implementation of existing policies, this means embracing the Sustainable Development Goals (SDGs) as an overarching framework for policymaking and action. The EU's new body of systemic, transformative policy frameworks is also vital for mobilising and guiding actions at different levels but important gaps remain, particularly for the food system.

The United Nations' 2030 Agenda for Sustainable Development and the SDGs provide an essential framework for steering and coordinating international efforts. Its full implementation in Europe and active support for implementation in other regions will be essential if Europe is to provide global leadership in achieving sustainability transitions. This is where we can also make greater use of the EU's Copernicus services to monitor the progress towards a sustainable Europe.

The interactions between the Sustainable Development Goals and environmental targets

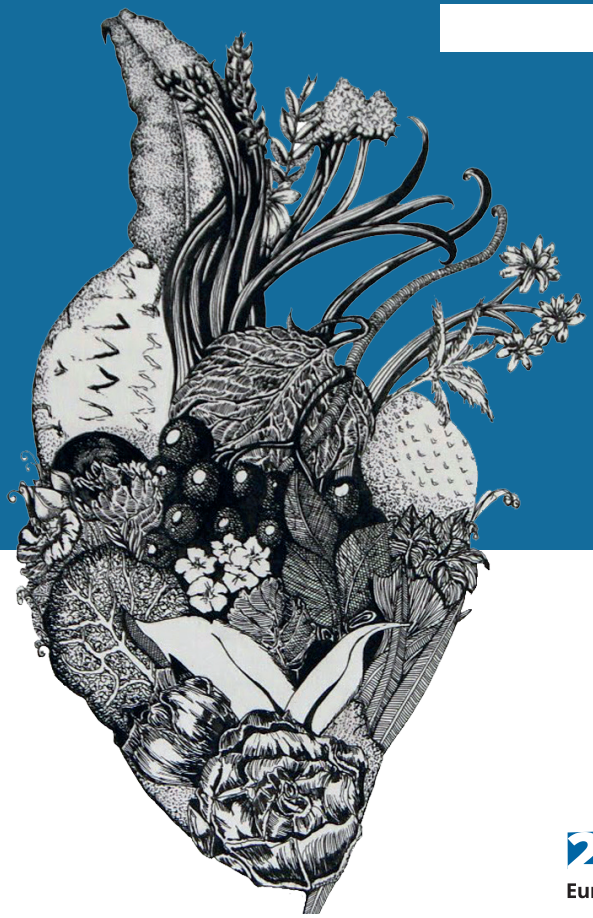
Source: EEA based on the United Nations' communications material.

A future in which we are all living well, within the limits of our planet requires us to transition to a new type of society. The EEA and Eionet are already supporting this change with experience, data and information, and know-how.

As a society, we face major challenges. We need enlightened policies and governance, and an engaged citizenry if we are to achieve, long-term sustainability.

Key human systems underpinning our society: energy, transport, food, farming and housing need to be rethought. Reliable and trusted data are ever more essential and we work with data from researchers and countries to the Earth-observation satellites of the Copernicus programme. Networking will allow new levels of innovation to come to fruition. New knowledge across environmental, social, political and financial boundaries and a culture of foresight will help us understand how we can most easily make major transitions in the way we live, eat, travel and use energy.

Europe is already a leader in environmental technology and research. Together with its empowered citizens, Europe will take an upbeat approach to make the right decisions and reach that long-term vision of creating a sustainable society. The future really does start now.



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