Greenhouse gas reductions and their drivers

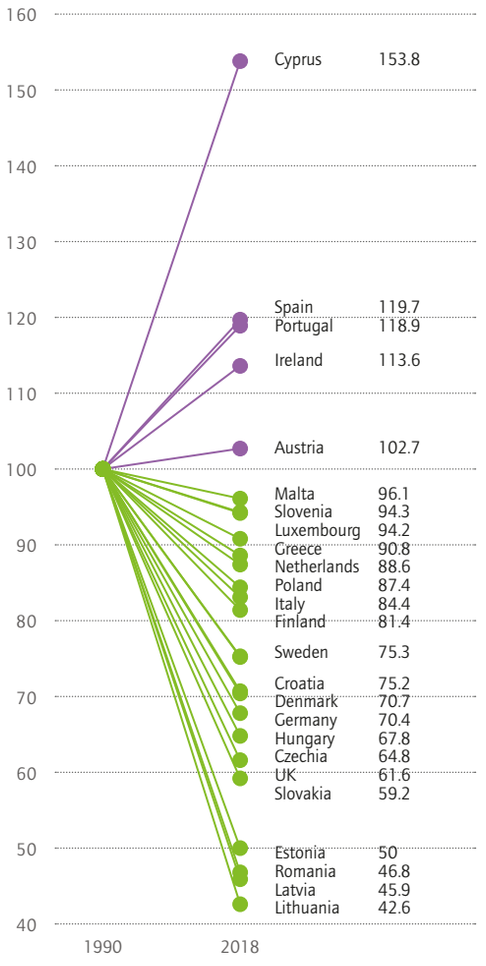
50%
of EU GHG reduction achieved by Germany and the UK

GHG reductions on a territorial basis

The reduction in total GHG emissions since 1990 means that the EU – even without the one-off effect of the Covid-19 crisis – will meet its 2020 target. However, projections reported by Member States show that the EU targets currently envisaged for 2030 and 2050 (despite falling short of the Paris objectives) are out of reach on a business-as-usual basis. Meeting even these non-satisfactory current targets would require significantly more effort, and even stricter targets are expected to be adopted within the European Climate Law proposal in Autumn 2020.

This section looks back over the past few decades and examines Member State performance in the reduction of GHG emissions in both quantitative and qualitative ways.

Figure 3.1 Greenhouse gas emissions in 2018, index (1990=100)



Source: EEA [env_air_gge].

As Figure 3.1 shows, most of the Member States reduced emissions between 1990 and 2018, contributing to the aggregate EU performance.

Most emissions cuts were due to economic restructuring and not to dedicated climate policies

In absolute terms, Germany and the United Kingdom accounted for about 50% of the EU net GHG reduction in this 28-year period. New Member States from central and eastern Europe showed the highest relative reductions, mostly due to the radical change in their economic structure during the transformation crisis of the 1990s; reductions in Romania, Latvia and Lithuania actually exceeded the 50% mark. Germany also 'benefited' greatly from the collapse of East German energy-intensive industries during the 1990s.

The overall net GHG emission reductions achieved by most Member States were, however, partly offset by higher GHG emissions in a few Member States such as Austria, Ireland, Portugal, Spain and Cyprus, which recorded increases of between 2.8% and 53% between 1990 and 2018.

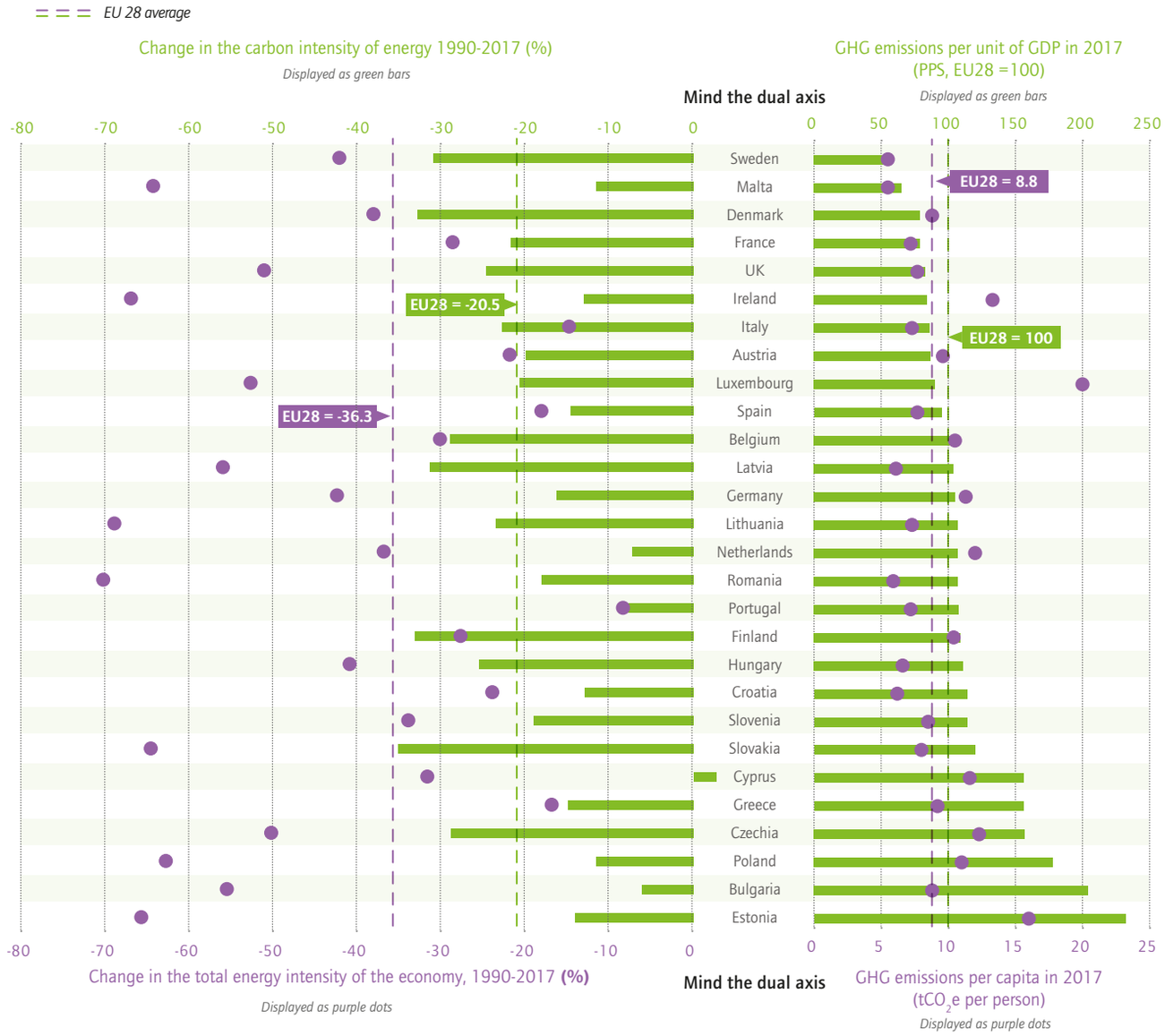
Structural features and drivers of emissions

Figures 3.2a and 3.2b show the structural features and key drivers underpinning GHG emissions: on the one hand, emissions per unit of GDP and emissions per capita in 2017 (Figure 3.2b (right)), and on the other, changes in energy demand and in the carbon intensity of energy generation over the period 1990-2017 (Figure 3.2a (left)).

In a business-as-usual scenario, higher GDP leads to higher GHG emissions, other factors being equal. Richer Member States with higher GDP per capita would thus also be expected to have higher GHG emissions per capita. However, Figure 3.2b (right) shows GHG emissions per capita by Member State and reveals that in reality there is no consistently direct link between GDP and emissions, illustrating that those 'other factors' matter a lot in the reduction of the latter. Such factors might be energy efficiency, energy intensity or the carbon intensity of energy generation, but the structure of the economy plays also an important role. Below we take a look at some of these factors in more detail. For example, emissions per capita are highest in Luxembourg and Estonia (20.0 and 16.0 total CO_2 per person), respectively the richest and one of the lower-income (but fast-growing) Member States. A common feature for both, however, is a relatively low level of decoupling of GDP from emissions: in other words, as their GDP grows, so do their

Figure 3.2a Change in the carbon intensity of energy 1990-2017 (%)

Figure 3.2b GHG emissions per unit of GDP in 2017 (PPS, EU-28 =100)



Source: EEA 2020 https://www.eea.europa.eu/publications/soer-2020/chapter-07_soer2020-climate-change/view, Table 7.3.

emissions. On the other hand, Sweden and Romania are among the countries with the lowest per capita emissions, again an unusual pair (one of the richest and one of the poorest Member States), but both with a strong record of decoupling.

Figure 3.2b (right) also shows GHG emissions per unit of GDP for Member States, depicting how much GHG they emit in the production of a unit of GDP (at purchasing power parities) relative to the EU28 average. There are important differences among countries. In 2017, Estonia, Bulgaria and Poland had the highest GHG intensity of GDP relative to the EU28 average (232%, 204% and 178%, respectively), while Sweden had the lowest, with 52% of the EU average. Trends over time (not shown by the graph for this indicator) suggest a downward convergence in emissions intensity among Member States as a combined effect of structural changes in economies (such as the shift towards less polluting services) and of a reduction in both energy use and in its carbon intensity. As a result, the levels of GHG emissions both per capita and per GDP are also more similar now across Member States than they were in 1990, illustrating a convergence process, with continued decoupling of GHG emissions from economic growth (EEA 2019a). It is worth noting that, by both measures, Sweden tops the list of Member States in the decoupling of GDP from emissions.

Decreasing emissions intensity is mostly driven by decreases in the energy intensity of the economy and by a lower carbon intensity of energy generation. The main trends by Member State between 1990 and 2017 are shown in Figure 3.2a (left). A decrease in the energy intensity of GDP is characteristic for all Member States, although to varying degrees. New Member States from central and eastern Europe (CEE) had the highest relative reductions (between 38% and 69%), while Portugal, Greece and Spain had, relatively, the lowest (between 4% and 14%). Lower energy intensity of economic growth can be explained by improvements in energy efficiency (in its transformation and end use, and also in energy savings) and the strong uptake of renewables, as well as by changes in the structure of the economy. Deindustrialisation in CEE countries and in Eastern Germany during the 1990s was a major driver, while a general trend for most Member States has been the services sector comprising a higher share of GDP, thus

leading to lower energy intensity in their economies. An increasing share of the services sector has been a general trend in most MS and contributed to lower energy intensity.

Beside reductions in energy intensity, the lower carbon intensity of energy generation has been a key factor underpinning lower emissions, in spite of a decline in nuclear electricity production in recent years. This positive trend has been due both to the higher contribution from renewable energy sources in the fuel mix and to the switch from more carbon-intensive coal to less carbon-intensive gas. With the exception of Cyprus, all Member States saw decreasing carbon intensity in their energy generation. Bulgaria, the Netherlands and Portugal had the smallest reductions in carbon intensity over the 27 years (between 6% and 8%); Poland achieved a reduction of 11.6%; while Belgium, Czechia, Denmark, Finland, Latvia, Slovakia and Sweden achieved the greatest reductions (between 28.8% and 35.2%).

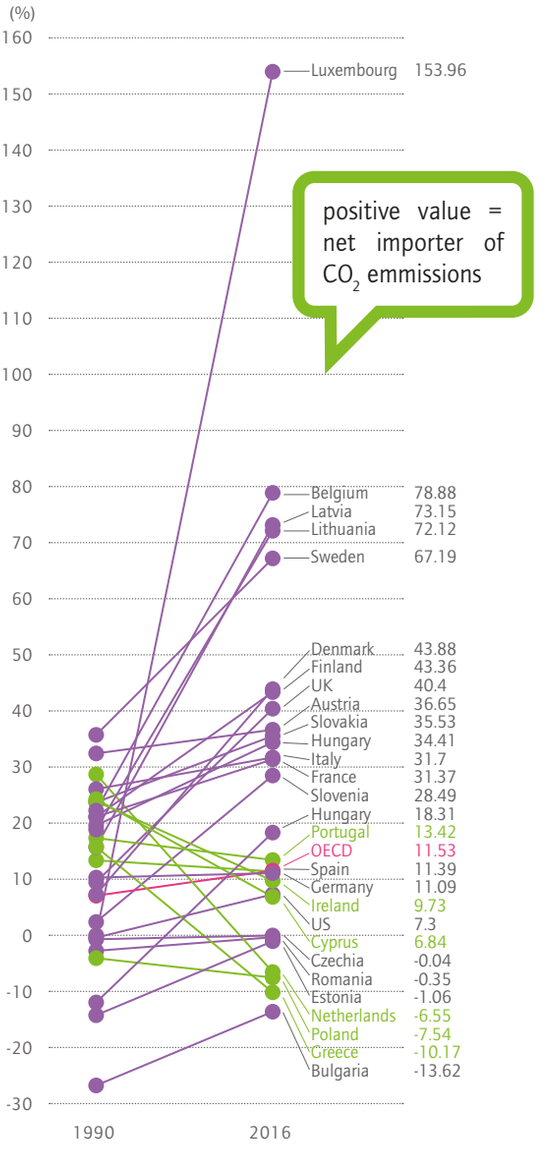
As regards the contribution of individual economic sectors to the reduction of GHG emissions, the picture is very mixed. EU climate mitigation policy is based on a distinction between GHG emissions from large industrial sources, which are governed by the EU Emissions Trading System (ETS) (European Commission, 2019a), and emissions from sectors covered by the Effort Sharing Regulation (European Commission, 2019b). Of the net EU reduction in total GHG emissions between 2005 and 2017, the sectors in the ETS accounted for two thirds, and the sectors not covered under the ETS accounted for one third. The sectors falling under the scope of the Effort Sharing Regulation currently represent about 60% of total greenhouse gas emissions in the EU, and they broadly include transport, waste and agriculture, as well as the heating systems of residential and commercial buildings, and the parts of industry not covered by the ETS. In the last couple of years, transport (in particular, road transport) and agriculture showed an increase of emissions. Section 3 will focus in more detail on the energy sector (which achieved a substantial GHG reduction) while Section 4 will address road transport, where initial reductions turned into a renewed increase of emissions in the last couple of years.

Consumption-based emissions

In addition to the commonly reported production-based ('territorial') emissions, statisticians also calculate 'consumption-based' emissions, by correcting the former to include CO_2 emissions 'embodied in trade'. Emissions embodied in trade are those emissions that occur during the production of traded goods and services. This type of estimate is also known or referred to as a 'carbon footprint'. Eurostat's calculation of the EU27's carbon footprint measures how much CO_2 would have been emitted due to the EU27's demand for products, if all imported products had been produced within the EU27 using an EU27 average production technology.

Figure 3.3 shows the share of emissions embodied in trade for most EU Member States for 1990 and

Figure 3.3 CO_2 emissions embedded in trade, as % of territorial emissions



Source: Global carbon project https://ourworldindata.org/consumption-based-co2.
Note: values shown, are for 2016

2016. Positive values mean that a country is a net importer of CO_2 emissions, as its emissions calculated on a consumption basis are higher than those based on production. Emissions embodied in trade actually grew between 1990 and 2016 for most Member States, indicating that their actual carbon footprint has tended to shrink more moderately than what the more widely used production-based calculations show. There are substantial differences, however, by Member State.

Most EU Member States (and the EU as a whole) are net importers of carbon emissions embodied in trade, and when examining emissions reductions over time, reductions in consumption-based emissions tend to be lower than reductions in production-based emissions.

A smaller reduction in consumption-based emissions

Initially, new CEE Member States tended to be net exporters of CO_2 emissions, meaning that their

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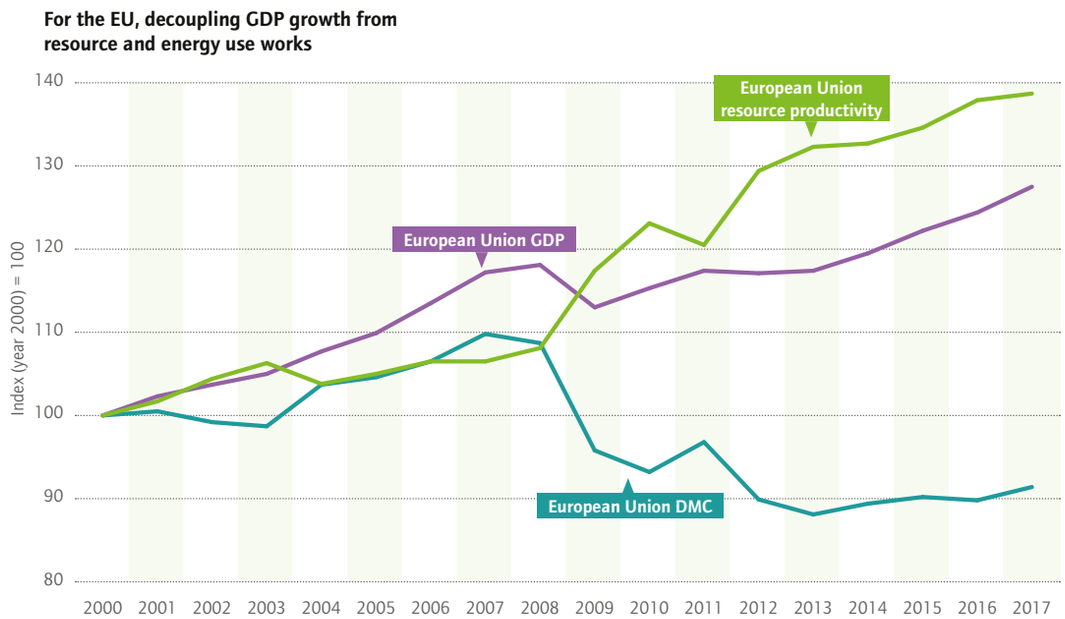
production-based (territorial) emissions were higher than their emissions linked to the goods and services they consumed. However, as these countries became richer with GDP and consumption growth, their net emissions export (as a share of total production-based emissions) showed a diminishing trend, with most of them becoming net importers of emissions by 2016 (see Figure 3.3). From this group, only Bulgaria, Czechia, Estonia and Poland remained net exporters of emissions. Belgium and Luxembourg also stood out for their high share of trade-embodied CO_2 imports, which in 2016 were equal to, respectively, 78% and 153% of their territorial emissions.

Following these changes over time provides an answer to the question of whether countries have mostly achieved emissions reductions by offshoring emission-intensive production to other non-EU countries. If only production-based emissions fell, whilst consumption-based emissions rose, this would suggest that Member States may have indeed 'offshored' emissions elsewhere. In general, this has not been the case: for the EU as a whole, including large, rich countries like France, Germany and the UK, both types of emissions decreased in this period. However, certain Member States like Belgium and Luxembourg did display this pattern.

Figure 3.4 shows the main trends of GHG emissions, domestic material consumption (DMC) and resource productivity (GDP/DMC) for the EU27.

To sum up, as GHG emissions, material use and resource use in the EU have been shrinking since 1990, while GDP has been growing, resulting in an increase in resource productivity, an absolute decoupling of GDP from the former can indeed be acknowledged. However, the extent of this is nowhere near enough to meet the 2030 targets and in particular the 2050 target of a net-zero-carbon economy. If Europe wants to maintain economic growth in the future, a much more radical decoupling of GDP growth from material use, resource use and GHG emissions is needed than what has been achieved so far. If we continue with the current economic model, only a full 'climate lockdown' could deliver a zero-carbon economy. However, the recent Covid-19 lockdown has demonstrated that this is an untenable policy proposition, and alternative and immediate action is therefore needed to address the climate emergency which combines environmental protection with social and economic sustainability.

Figure 3.4 EU28 domestic material consumption, gross domestic product, and resource productivity (2000-2017)



Source: EEA 2020.