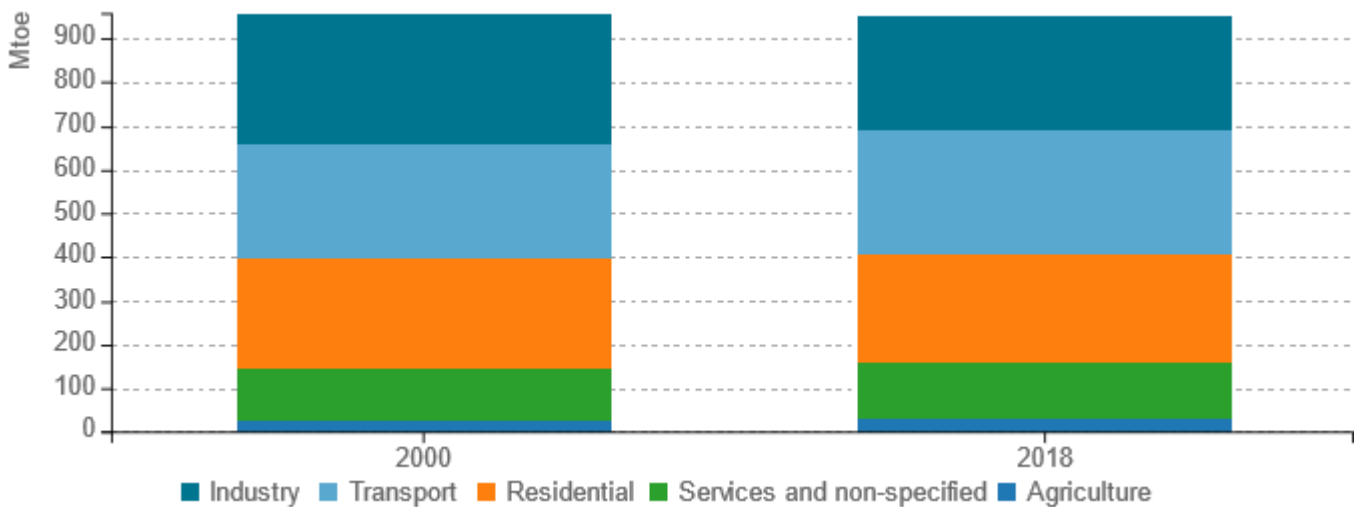


# Energy efficiency trends and policies

## Overview

Final energy consumption is growing again since 2014 with the economic growth rebound (+1%/year), recovering its 2000 level at around 950 Mtoe. It has been increasing until 2007 (+0.6%/year over 2000-2007) and decreasing between 2007 and 2014 because of the economic crisis (-1.2%/year). The share of transport in final energy consumption has increased (from 27% in 2000 to 30% in 2018), as for services (from 12 to 14%). On the other hand, the share of industry has decreased by almost 4 percentage points, from 31% in 2000 to 27% in 2018. Households' share is rather stable (26%), as well as that of agriculture (3%).

Figure 1: Final energy consumption by sector (normal climate)

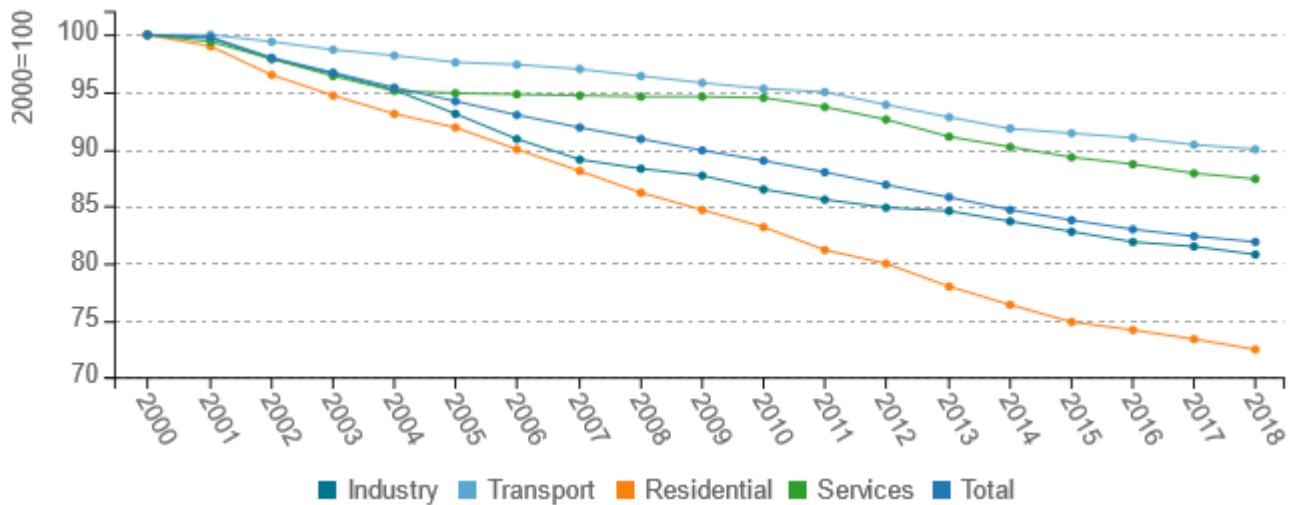


Source: ODYSSEE

Energy efficiency of final consumers, as measured by ODEX indicator, improved by 1.1%/year between 2000 and 2018, i.e. by 18% over the period. Larger gains have been achieved for households (1.8%/year) with a net slowdown since 2015 (1.1%/year against 1.9%/year before). The rate of energy efficiency improvement has almost halved in industry since the economic crisis (-0.9%/year since 2007 compared to 1.6%/year before). The transport sector has progressed the least: only by 10% since 2000, that is 0.6%/year. There was few “measurable” progress in services before 2010; since then, energy efficiency is improving by 1%/year.



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Within the "Clean Energy for all Europeans package", eight legislative acts entered into force between May 2018 and May 2019. Concerning energy efficiency, especially the revisions of the EPBD (EU 2018/844) and the EED (EU 2018/844) were important. The revised EED both includes a tightened target for energy efficiency of at least 32.5% by 2030 (Article 3) and a new target for the energy savings obligation under Article 7 for the obligation period 2021-2030. The future energy efficiency policy will be driven by the "European Green Deal", presented by the Commission in December 2019. As part of the Green Deal, the Commission proposed a tightening of the greenhouse gas reduction target from 40% to 55% by 2030 (compared to 1990) and a "European Climate Law". The "Fit for 55" legislative package, which is part of the Commission's 2021 work program, includes twelve directives and regulations to be adapted. Of particular relevance for energy efficiency are the planned revisions of the Emission Trading System (ETS), the Effort Sharing Regulation (ESR), the Energy Taxation Directive, the CO2 emission standards for vehicles, and the EPBD and EED. According to the Impact Assessment, another tightening of the energy efficiency target will be necessary.

Table 1: Sample of cross-cutting measures

Measures	NEEAP measures	Description	Expected savings, impact evaluation	More information available
(Amended) Energy Efficiency Directive (EED)	yes	The new amending Directive on Energy Efficiency (EU 2018/844) updated the energy efficiency policy framework to 2030. The key element is the new headline target for energy efficiency.	Expected final energy consumption in 2030 (compared to a BAU-Scenario): not more than 846 Mtoe (without UK)	<a href="https://ec.europa.eu/en/energy/topics/energy-efficiency/targets-directive-and-rules/energy-efficiency-directive_en">https://ec.europa.eu/en/energy/topics/energy-efficiency/targets-directive-and-rules/energy-efficiency-directive_en</a>

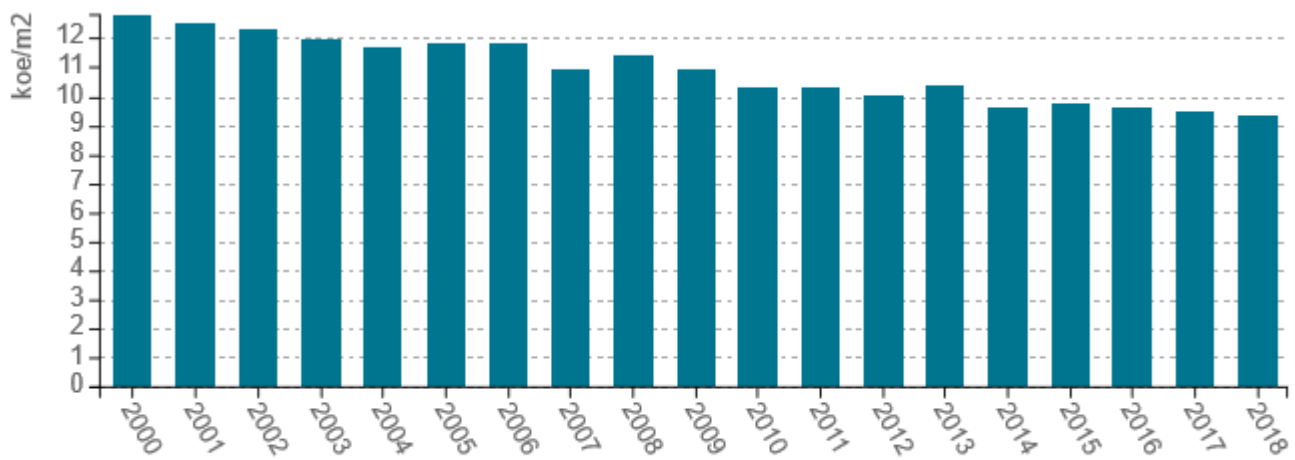
Source: MURE



### Buildings

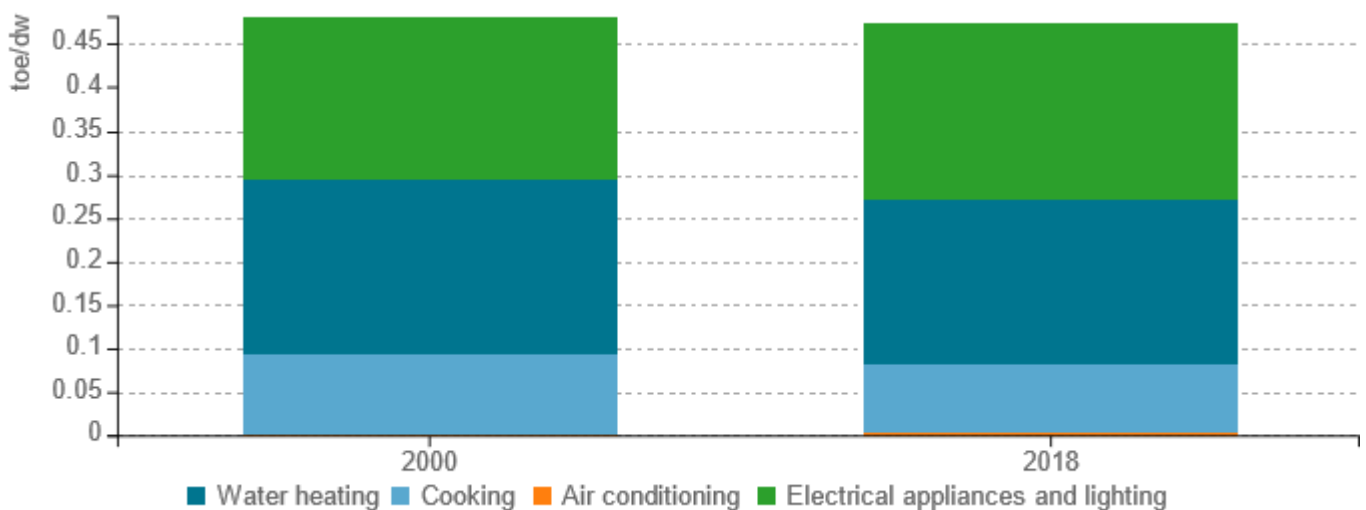
Heating is by far the largest end-use for households (64% in 2018). The heating consumption of households per m<sup>2</sup> has been decreasing by 1.7%/year thanks to the tightening of building codes, coupled with financial incentives to promote thermal retrofitting of existing dwellings and the adoption of more efficient heating systems. The energy consumption per dwelling decreased less than the consumption per m<sup>2</sup> (by 0.9%/year and 1.3%/year respectively) because of an increase in the average dwelling size (+0.4%/year since 2000). The shares of cooking and water heating are decreasing while electrical appliances account for a higher share; the share of air conditioning (AC) is still marginal.

**Figure 3: Energy consumption of space heating per m<sup>2</sup> (normal climate)**



Source: ODYSSEE

**Figure 4: Energy consumption per dwelling by end-use (except space heating)**

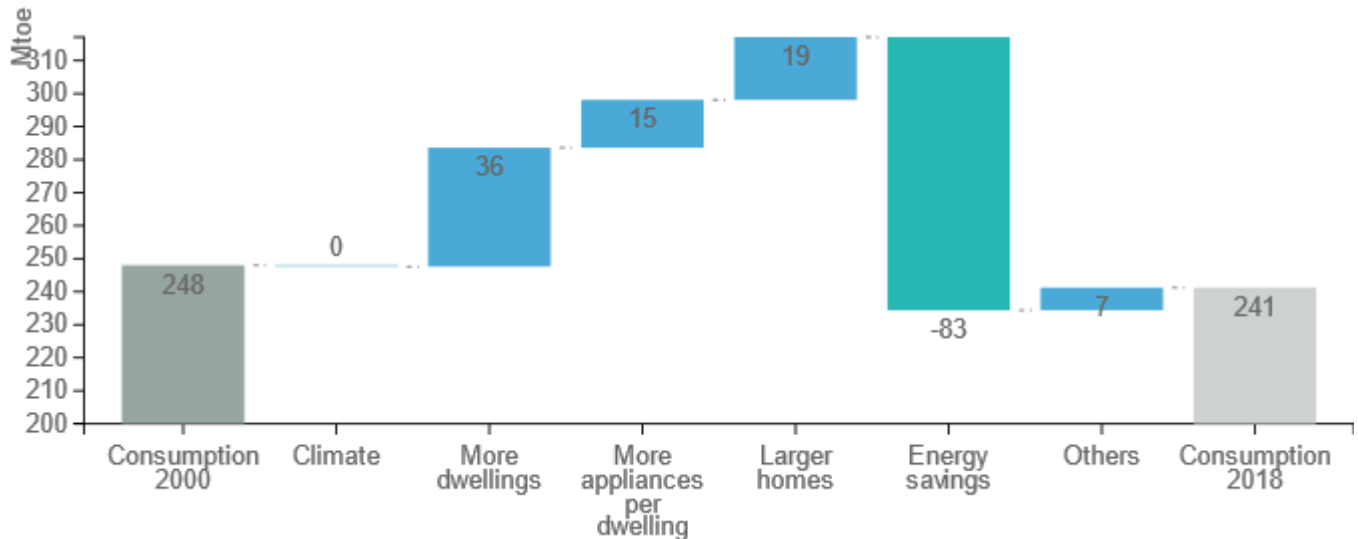


Source: ODYSSEE



In 2018, energy consumption of households was slightly below its 2000 level (-7 Mtoe or around 3%). Three main factors contributed to increase energy consumption over the period: a growing number of dwellings (+36 Mtoe), larger homes (+19 Mtoe) and an increasing number of appliances (+15 Mtoe). Energy savings (83 Mtoe) more than offset the effect of these factors.

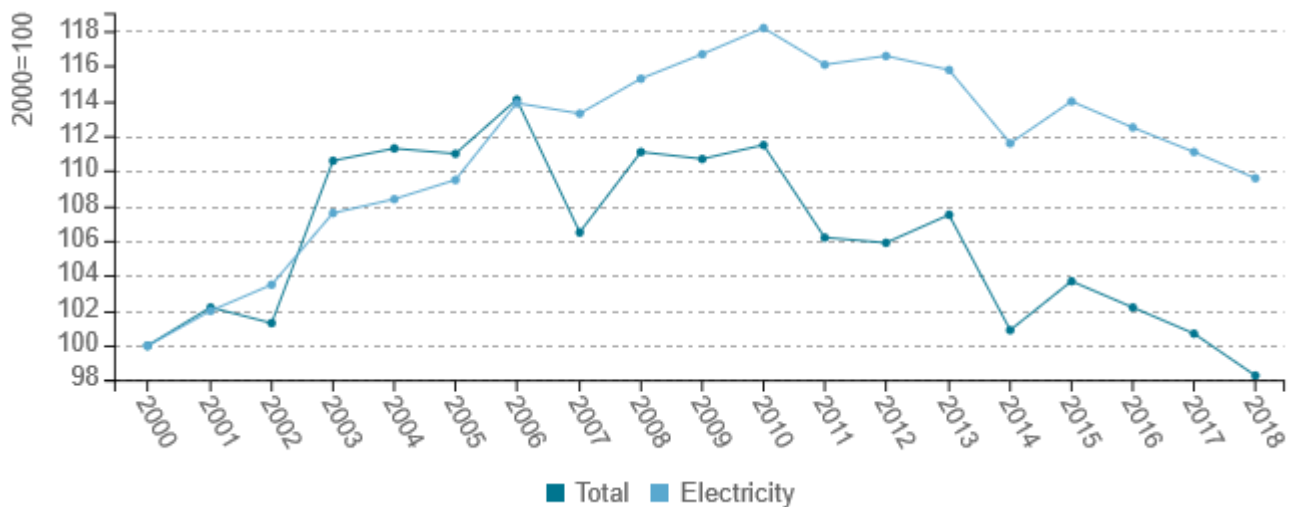
Figure 5: Main drivers of the energy consumption variation of households



Source: ODYSSEE

The energy consumption per employee has overall been decreasing since 2010 (-1.6%/year) and is slightly below its 2000 level in 2018 (0.87 toe). It increased during the period of low economic growth (2007-2010) (+1.6%/year) as the consumption decrease did not follow the activity slowdown. The electricity consumption per employee increased by 1.7%/year until 2010 and has been decreasing afterwards (-0.9%/year) down to around 5000 kWh in 2018.

Figure 6: Energy and electricity consumption per employee (normal climate)



Source: ODYSSEE



The legislative framework for the European building sector is set by two key regulations. The Energy Performance of Buildings Directive (EPBD) was first introduced in 2010 (2010/31/EU), the Energy Efficiency Directive (EED) in 2012 (2012/27/EU). Both Directives were amended in 2018 (amended EPBD: 2018/844/EU; amended EED: 2018/1999/EU). Another amendment is announced in the “Fit for 55” package.

Electrical appliances are regulated by energy labelling and ecodesign requirements. A new Energy Labelling regulation (2017/1369/EU) was adopted in July 2017, replacing the former Labelling Directive (2010/30/EU). It includes several new issues, such as a reintroduction of the original A-G scale for labelling and a new database (EPREL). The labelling framework covers 15 product groups, most of them related to the household sector. The ecodesign requirements for individual product groups are created under the EU's Ecodesign Directive (2009/125/EC) in a structured process coordinated by the European Commission. The EU legislation on ecodesign is applicable on 31 product groups, of which the majority is related to buildings. On 1 October 2019, the Commission adopted 10 Ecodesign Implementing Regulations of which eight revised existing requirements (refrigerators, washing machines, dishwashers, electronic displays, light sources, external power suppliers, electric motors, power transformers) and two new regulations (refrigerators with direct saled function, welding equipment).

**Table 2: Sample of policies and measures implemented in the building sector**

Measures	Description	Expected savings, impact evaluation	More information available
Amended Energy Performance of Buildings Directive (EPBD)	With the amendment of the former EPBD from 2010 in 2018, some new measures were introduced to modernise the EU's building sector and to increase the renovation rates. These measures include long-term renovation strategies to be delivered by the MS, Minimum energy Performance Standard for new and existing buildings, energy performance standards for buildings as well as the nearly zero-energy buildings (NEZEB) standard for new buildings from 31 December 2020.	Reduction of annual final energy use in 2030: 28 Mtoe. Reduction of CO2 emissions: 38 Mt. Result of Impact assessment (preferred Option)	<a href="https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en">https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en</a>

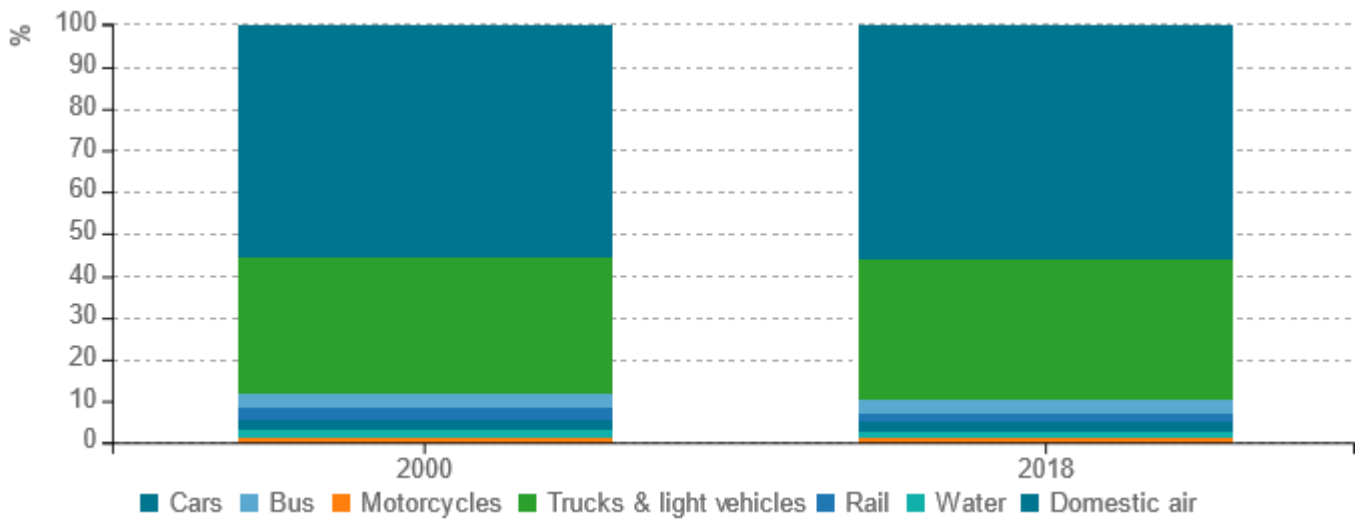
Source: MURE



### Transport

The distribution of transport energy consumption by mode has remained almost stable since 2000, road transport accounting for around 94%. Cars represent 56% of the sector's consumption and road freight transport (trucks and light duty vehicles) 33% in 2018.

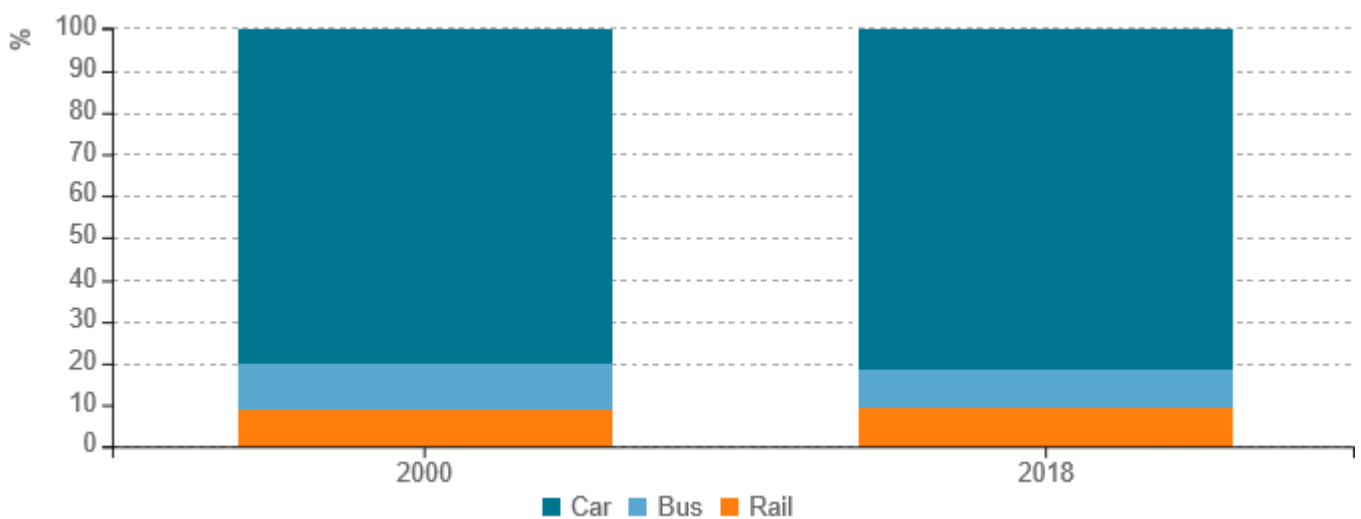
**Figure 7: Transport energy consumption by mode**



Source: ODYSSEE

Passenger traffic increased by 14% since 2000, to reach around 5200 Gpkm in 2018. The share of public transport remained stable (around 19%). This stability is the result of opposite trends in Member States, with a decrease in the majority of countries (60%) but an increase in some of the largest countries (e.g. Italy and France).

**Figure 8: Modal split of inland passenger traffic**

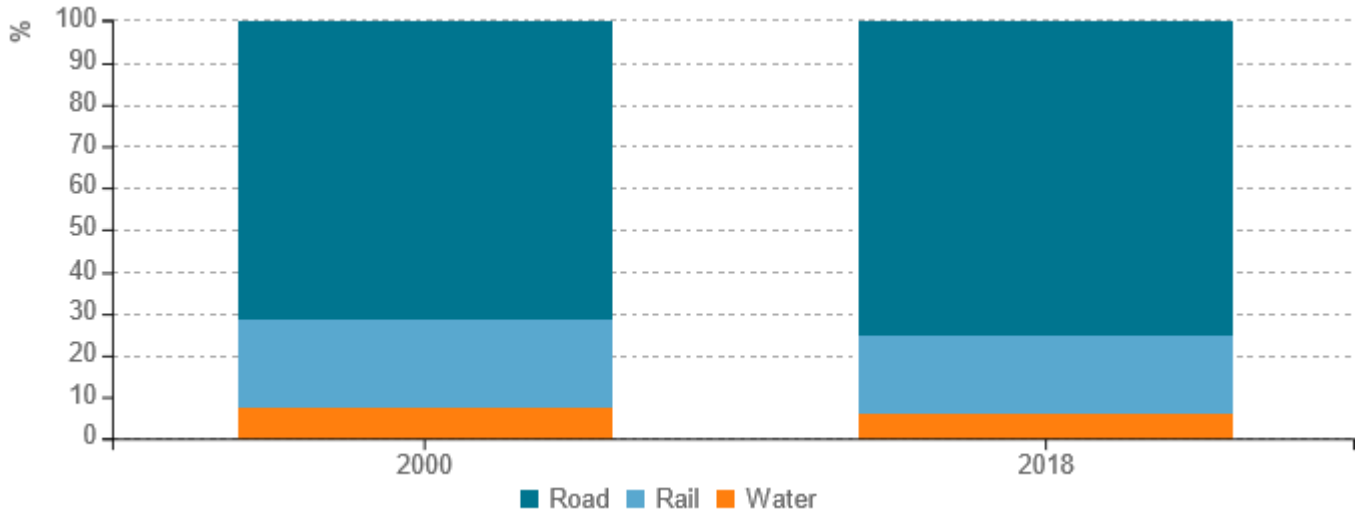


Source: ODYSSEE



Freight traffic increased by 24% since 2000 to reach around 2300 Gtkm in 2018. The share of rail and water traffic (25% in 2018) has decreased at EU level (-4 points), despite the policies implemented to promote these modes.

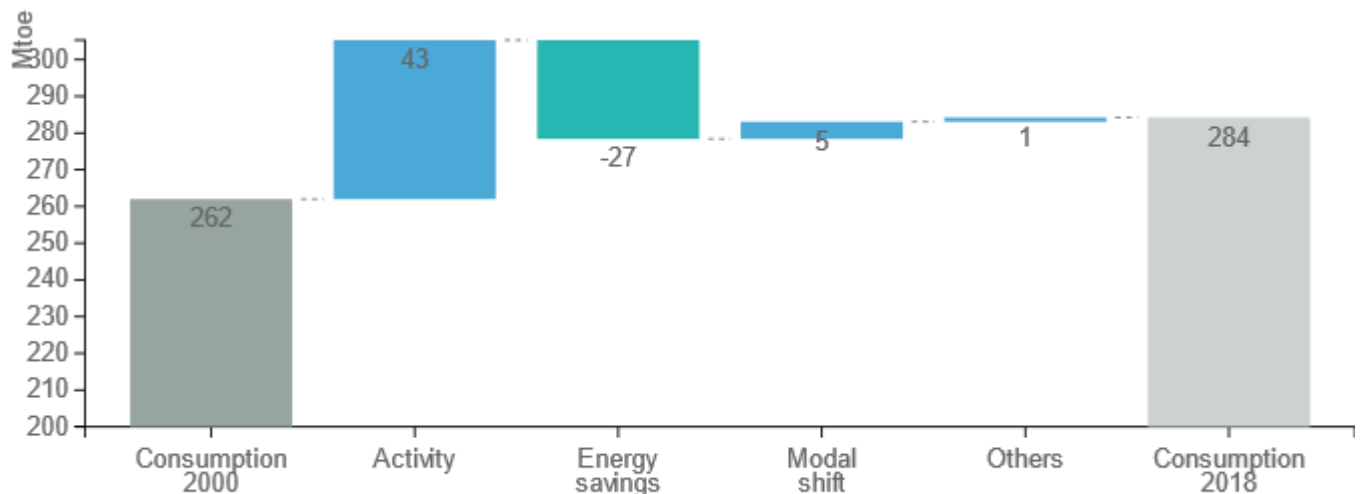
**Figure 9: Modal split of inland freight traffic**



Source: ODYSSEE

The consumption of transport increased by 22 Mtoe since 2000. The growth in passenger and freight traffic contributed to increase energy consumption (by 43 Mtoe). Energy savings (i.e. efficiency improvement of cars, trucks, etc.) counterbalanced two thirds of this effect by decreasing energy consumption by 27 Mtoe. Modal shift from bus to private car and from rail to road for freight led to a 5 Mtoe rise in consumption.

**Figure 10: Main drivers of the energy consumption variation in transport**



Source: ODYSSEE



The key Directives to increase energy efficiency and reducing CO<sub>2</sub> emissions in road transport are mandatory emission reduction targets for new vehicles. For new cars, such targets have been set since 2009 (Regulation 443/2009/EC), for vans since 2011 (Regulation 510/2011/EU). From 1 January 2020, new CO<sub>2</sub> standards are in place for new cars and vans for 2025 and 2030 (Regulation (EU) 2019/631). In 2019, CO<sub>2</sub> emission standards have also been adopted for heavy-duty vehicles (Regulation 2019/1242/EU), setting targets for new lorries for 2025 and 2030. Regarding CO<sub>2</sub> emissions of aviation, they have been included in the EU emissions trading system since 2012. An amendment both of the ETS and the CO<sub>2</sub> vehicle standards is foreseen in the “Fit for 55” package.

**Table 3: Sample of policies and measures implemented in the transport sector**

Measures	Description	Expected savings, impact evaluation	More information available
CO <sub>2</sub> emission performance standards for new passenger cars and for new light commercial vehicles (Regulation (EU) 2019/631)	The Regulation sets new EU fleet-wide CO <sub>2</sub> emission targets for the years 2025 and 2030 for newly registered passenger cars and vans. The targets are defined as a percentage reduction: for cars 15% reduction from 2025 and 37.5% from 2030; for vans 15% reduction from 2025 and 31% from 2030.	GHG emission reduction in 2030 (comp. to 2005): 23%	<a href="https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en">https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en</a>
CO <sub>2</sub> emission performance standards for new heavy-duty vehicles (Regulation (EU) 2019/1242)	The regulation sets CO <sub>2</sub> emission standards for heavy-duty vehicles by Setting targets for reducing the average emissions from new lorries for 2025 and 2030. The Regulation also includes a mechanism to incentivise the uptake of zero- and low-emission vehicles, in a technology-neutral way.	Annual CO <sub>2</sub> reduction by 2030: 54 Mt.	<a href="https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en">https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en</a>

Source: MURE

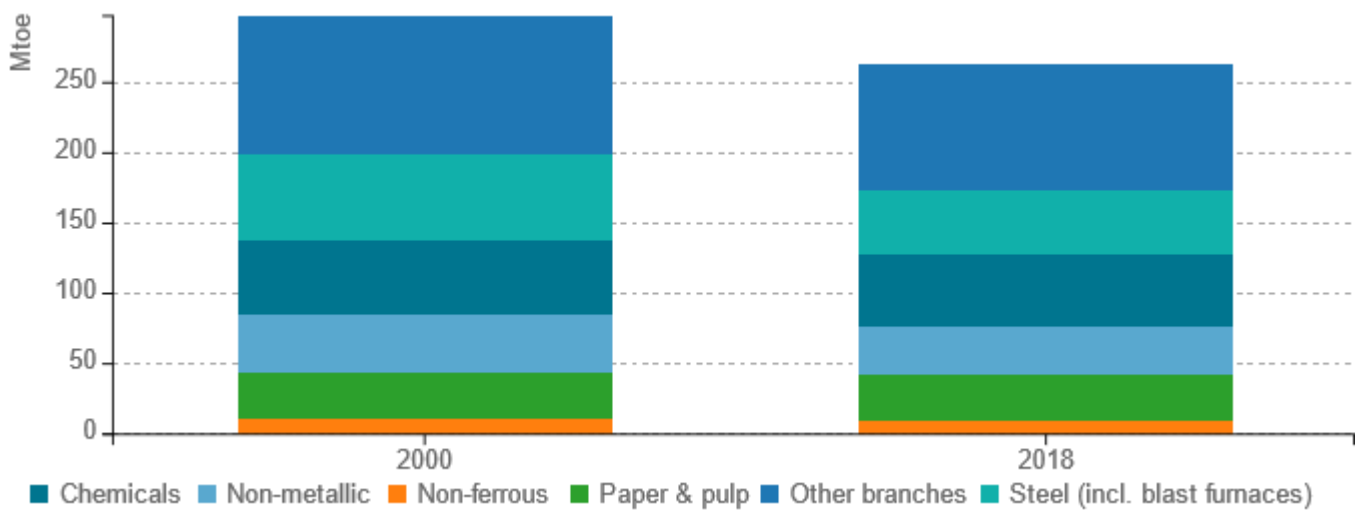




### Industry

Since 2000, energy consumption has decreased in all industrial branches. Chemical and steel industries are the main energy consuming branches (respectively 20% and 18% of total industry consumption in 2018); while the share of chemicals is increasing (+2 points since 2000), the share of steel is declining (-3 points).

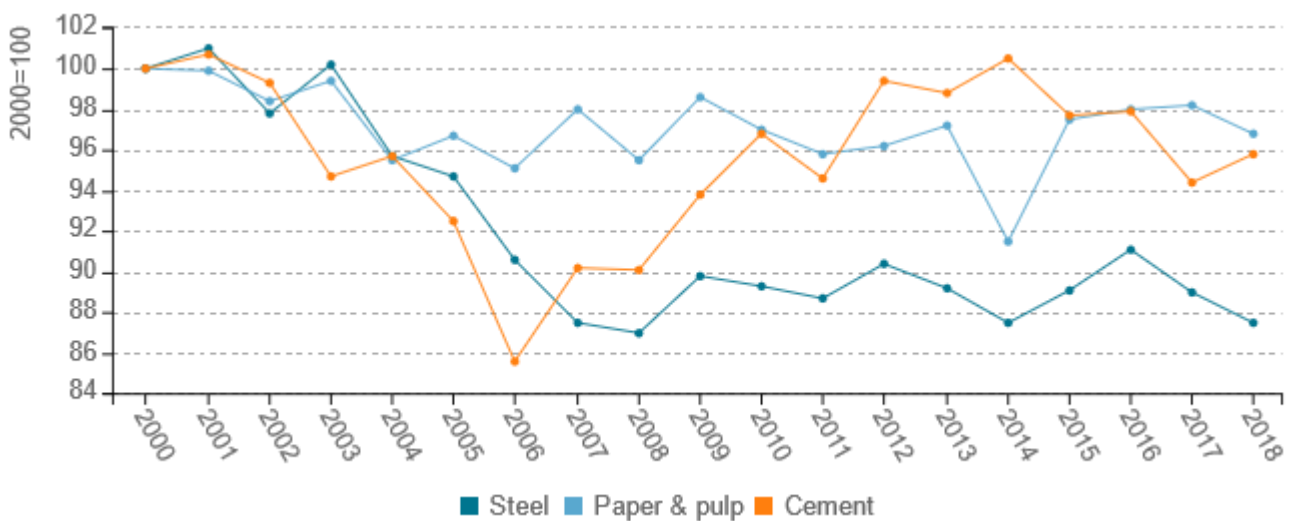
Figure 11: Final energy consumption of industry by branch



Source: ODYSSEE

After a sharp decrease over 2000-2007 (-1.9%/year), the specific consumption of steel has been almost stable since 2007. The specific consumption of pulp and paper decreased slightly since 2000 (-0.2%/year). The specific consumption of cement fell sharply between 2000 and 2006 (-2.6%/year) before rebounding during the crisis. Since 2014, it has decreased again (-1.2%/year).

Figure 12: Unit consumption of energy-intensive products (toe/t)

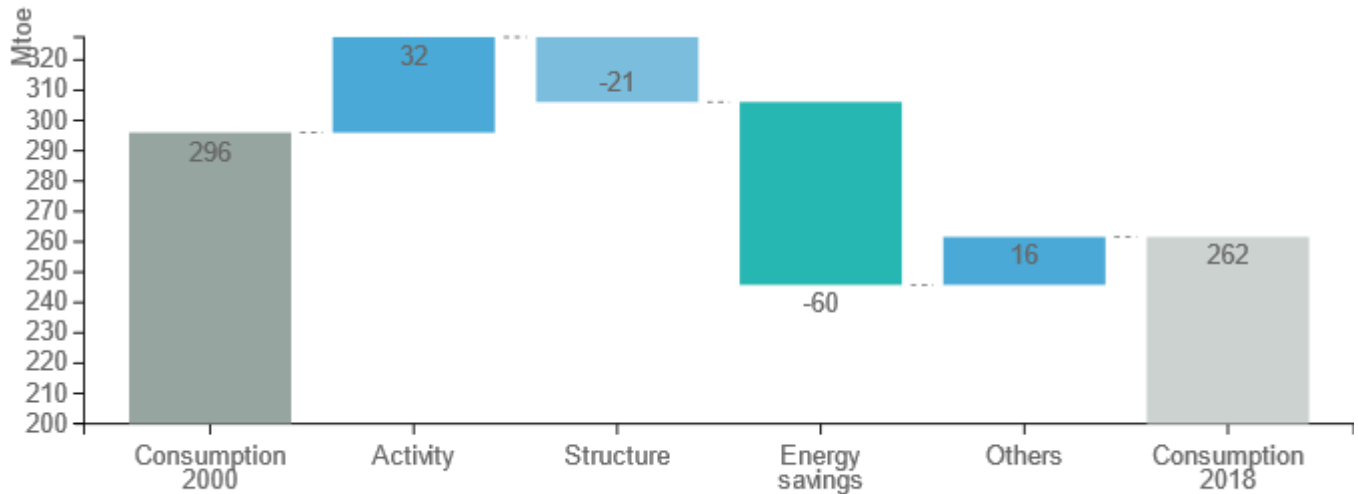


Source: ODYSSEE



The industry energy consumption decreased by around 35 Mtoe between 2000 and 2018. This is mainly due to energy savings (60 Mtoe) and to a lesser extent to structural effects (21 Mtoe), i.e. the fact that less intensive branches increased their contribution in industrial value added. Growth in industrial activity (measured with the production index) had a relatively limited effect (32 Mtoe), due to the recession over 2007-2013.

**Figure 13: Main drivers of the energy consumption variation in industry**



Source: ODYSSEE

The key regulation for energy-intensive industries is the emissions trading system (ETS). The legislative framework for the current trading period (phase 4 from 2021-2030) was revised in early 2018. Another revision is foreseen in the “Fit for 55” package. Industrial cross-cutting technologies (as e.g. circulators, electric motors, computers and servers, fans) are regulated by the EU's Ecodesign Directive (2009/125/EC). A key funding programme for industry is the EU Innovation Fund for demonstration of innovative low-carbon technologies.

**Table 4: Sample of policies and measures implemented in the industry sector**

Measures	Description	Expected savings, impact evaluation	More information available
EU Emission Trading System (EU ETS)	The "cap and trade" system covers CO2 emissions from power and heat generation, energy intensive industries as well as commercial aviation.		<a href="https://ec.europa.eu/clima/policies/ets_en">https://ec.europa.eu/clima/policies/ets_en</a>

Source: MURE

