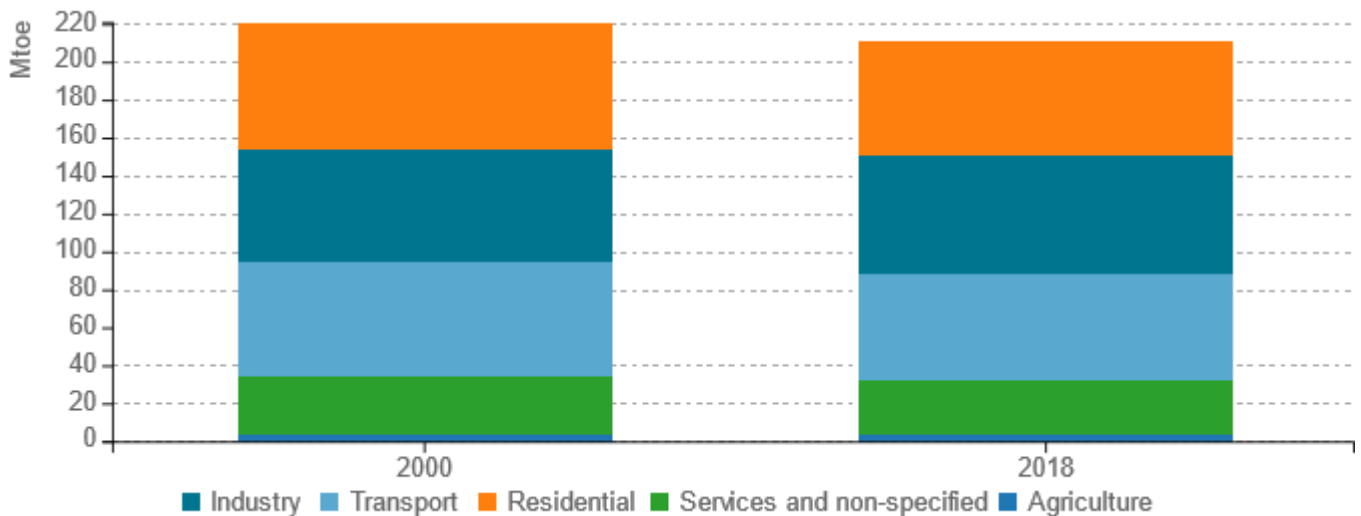


Energy efficiency trends and policies

Overview

Germany's total final energy consumption of 2018 was slightly below its 2000 level (-9.2 Mtoe, i.e. -4%). In 2018, the largest consuming sector is industry, representing 29.4% of total final energy consumption. The share of residential has slightly decreased from 30.0% to 28.7% in 2018, while industry increased its share from 26.4% to 26.9%. The share of transport in total consumption decreased slightly from 27.2% to 26.9% (see Figure 1).

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

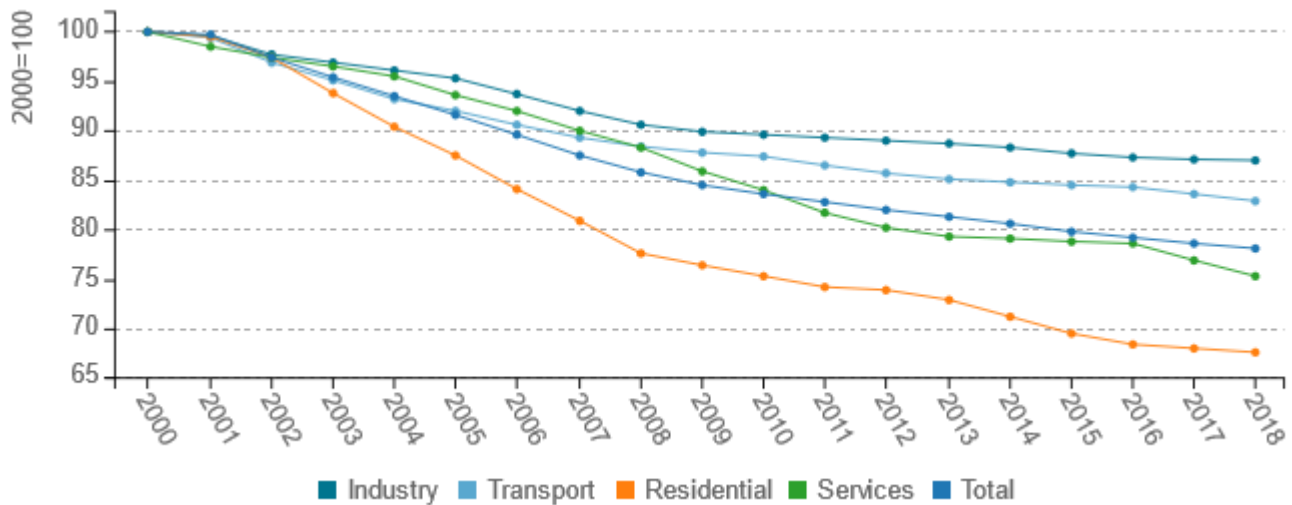


Source: ODYSSEE

Energy efficiency for final consumers, as measured by the so-called technical ODEX, has improved by around 1.4% per year since 2000. Larger gains have been registered for households (2.2%/year), against 1.0%/year for transport and 1.6%/year for the services sector. A lower annual rate of improvements has been achieved in the industry sector (0.77%/year).



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

With the Energy Concept from 2010, Germany set indicative energy and Climate Targets for 2020 and 2050. In order to achieve the 2020 targets, the "Climate Action Programme 2020" was adopted in 2014. The long-term strategy to achieve a climate neutral Germany in 2050 was set in 2016 with the "Climate Action Plan 2050". The plan also included sectoral GHG targets for 2030. With the "Climate Action Programme 2030" from October 2019, a broad package of measures to achieve these targets was decided, comprising innovations, funding, regulation, and a new pricing system for greenhouse gases starting in 2021. With the "Federal Climate Change Act" from December 12, 2019, the sectoral 2030 targets have been made legally binding. The "Energy Efficiency Strategy 2050" was also adopted in December 2019. It defines a new energy efficiency target for 2030 (reduction of 30% in primary energy consumption by 2030 compared to 2008) and thereby contributes to the new EU target for 2030, bundles the necessary measures in a new "National Action Plan for Energy Efficiency" (NAPE 2.0) and contains a dialogue process "Roadmap Energy Efficiency 2050", which started in May 2020. On June 10, 2020, the "National Hydrogen Strategy" was adopted.

Table 1: Sample of cross-cutting measures

Measures	In NEEAP	Description	Expected savings	More information
CO2 pricing for the transport and heating sectors	yes	New CO2 pricing for fossil fuels in the transport and heating sectors (without parts of industry already covered by EU ETS) starting from 2021 with a yearly increasing CO2 price until 2025 and an emission trading system with a cap from 2026	2030: 145.5 PJ (without measure interaction effect) / 138.2 PJ (with measure interaction effect)	https://ec.europa.eu/energy/sites/default/files/documents/de_final_necp_main_en.pdf
Climate Action Programme 2020	yes	Program containing several components to push the achievement of the 2020 climate target	2020: 43 – 56 Mt CO2eq.	https://www.bmu.de/download/wissenschaftliche-grundlagen-zum-klimaschutzbericht-2018/

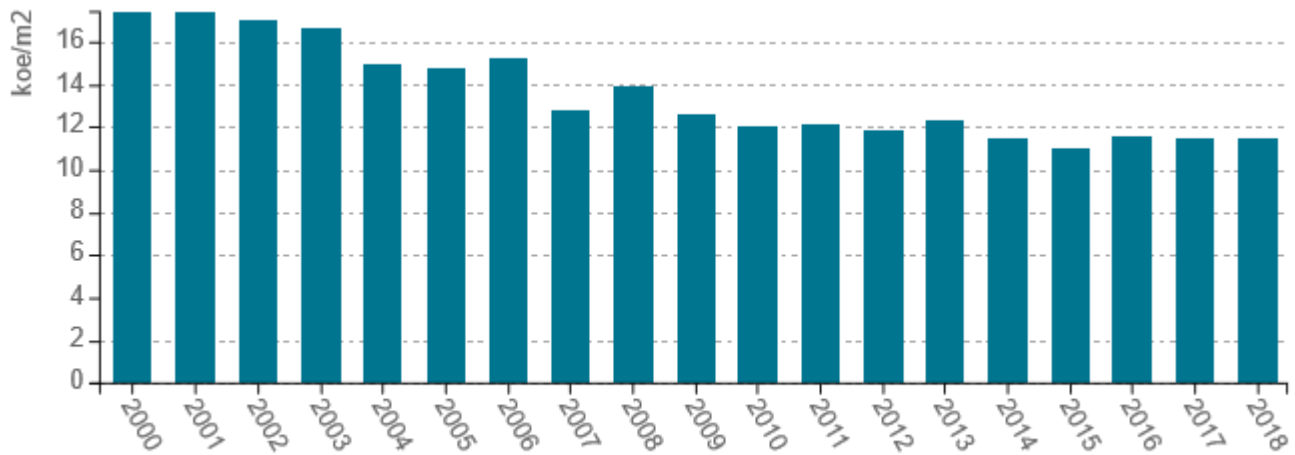
Source: MURE



Buildings

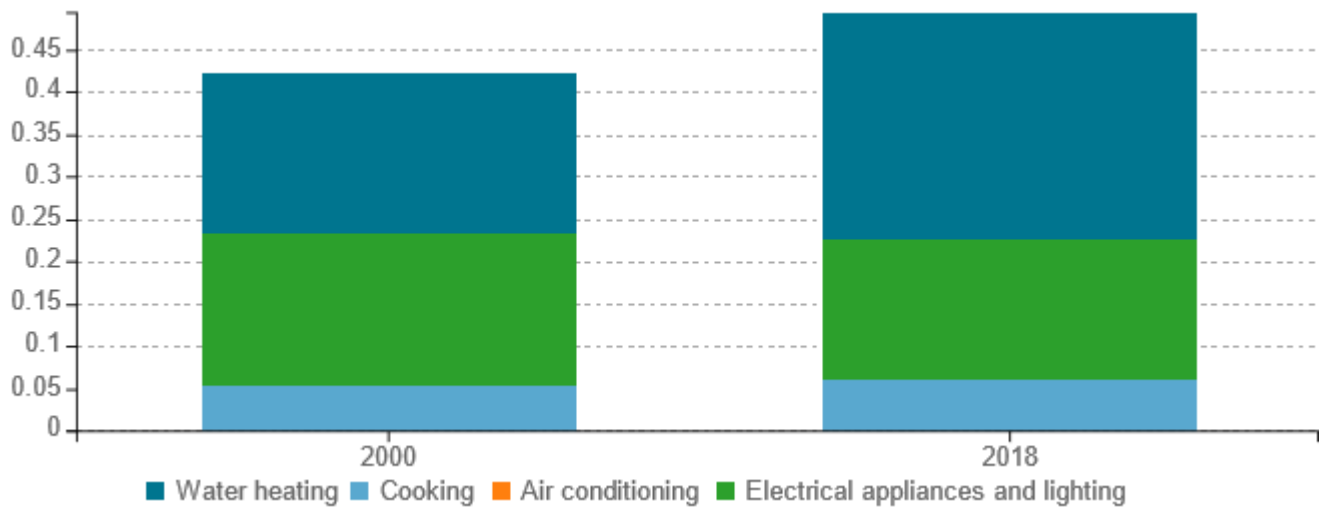
As shown in Figure 3 the household energy consumption per m² for space heating has decreased by 34% since 2000, from 17.4 koe/m² to 11.5 koe/m² in 2018. While the consumption per dwelling for water heating increased by 41% from 2000 to 2018 (from 0.19 toe/dw to 0.27 toe/dw), while the consumption for appliances and cooking stayed almost constant (see Figure 4).

Figure 3: Energy consumption of space heating per m² (normal climate)



Source: ODYSSEE

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

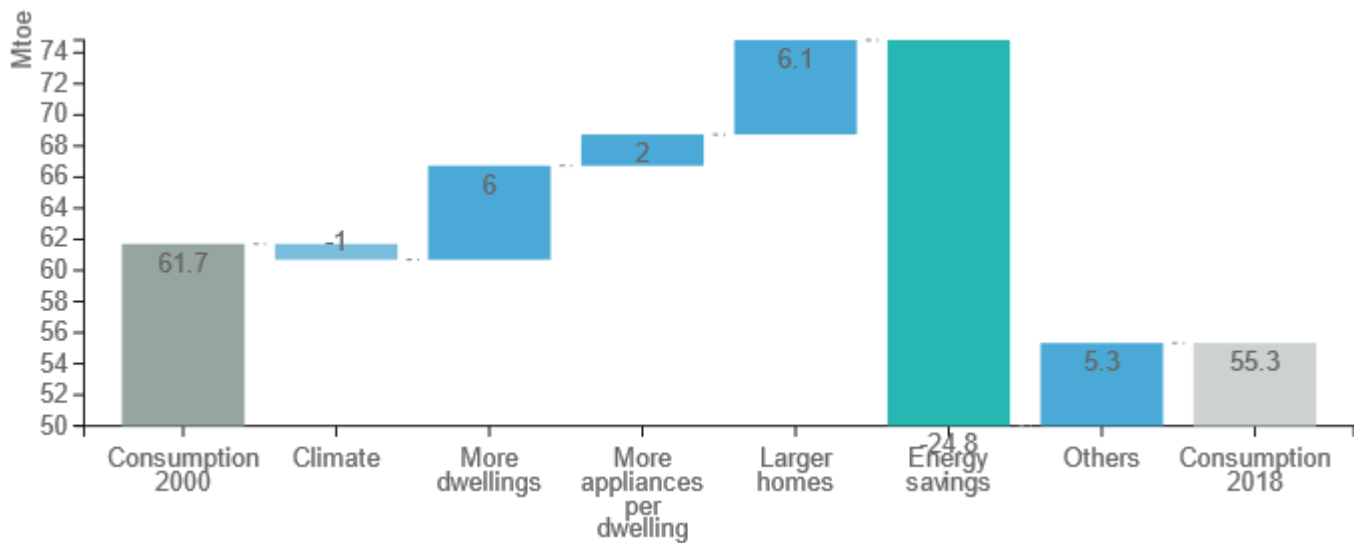


Source: ODYSSEE



Figure 5 shows a decomposition of the change in energy consumption. It shows that the total final energy consumption of households decreased by around 6 Mtoe between 2000 and 2018. Two main factors contributed to an increase in energy consumption – more dwellings (6 Mtoe) and lifestyle/comfort (8 Mtoe, due to larger homes and more appliances per dwelling). On the opposite, energy savings decreased the consumption by around 25 Mtoe, while climate effects had only a small decreasing impact of 1 Mtoe.

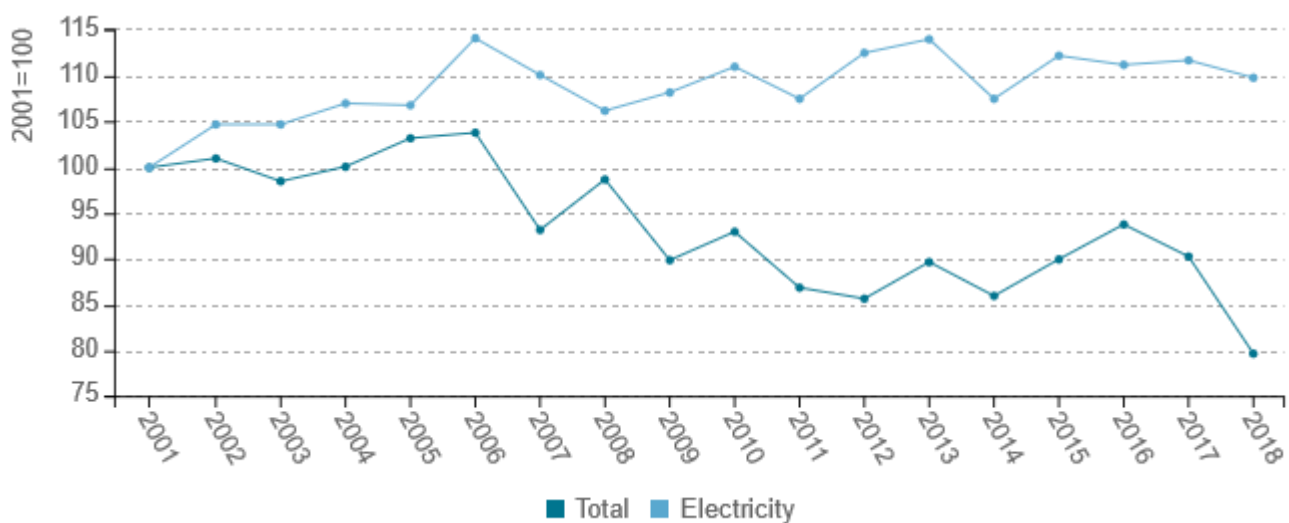
Figure 5: Main drivers of the energy consumption variation of households



Source: ODYSSEE

Figure 6 shows the development of the specific energy consumption in households for both electricity and total final consumption. While the electricity consumption per squaremeter has been steadily increasing over time (by about 10% from 2001 to 2018), the total consumption dropped significantly in the same period (about 20% compared to 2001).

Figure 6: Energy and electricity consumption per m² (normal climate)



Source: ODYSSEE



To achieve the target of a virtually climate-neutral building stock in Germany by 2050, a set of programmes was established, of which some have already been in place for many years. As decided in the Climate Action Programme 2030, the funding conditions for these programmes are improved and combined in a new "Federal funding for efficient buildings (BEG)" starting in 2020. It consists of several modules which come from the former funding programmes: (1) BEG Residential Buildings (former KfW programme for energy-efficient construction and renovation) (2) BEG Non-residential Buildings (former KfW programme for energy-efficient refurbishment of non-residential buildings) (3) BEG Individual Measures BAFA (former KfW Market incentive programme for renewable energies incl. APEE). As an alternative to the Federal funding, tax incentives for the energy-efficient renovation of residential buildings were also introduced from 2020. The Corona stimulus package of June 3, 2020 also included an increased funding for building refurbishment. The new "Buildings Energy Act (GEG)" came into force on November 1, 2020, bringing together the previous Energy Savings Regulation (EnEV) and the Renewable Energy Heat Act (EEWärmeG). The GEG regulates the energy requirements for new and existing buildings and for the use of renewable energies in buildings.

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

Measures	Description	Expected savings, impact evaluation	More information available
Federal funding for efficient buildings (BEG)	New funding program for existing building merging previous programs and improved funding conditions.	2030: 79.3 PJ (net impact without measure interaction effect) / 55.5 PJ (net impact and also taking into account measure interaction)	https://ec.europa.eu/energy/sites/default/files/documents/de_final_necp_main_en.pdf
Tax incentives for energy-related building renovations	Tax reduction for energy-related measures for buildings used for own residential purposes.	2030: 24.3 PJ (net impact without measure interaction effect) / 23.1 PJ (net impact and also taking into account measure interaction)	https://ec.europa.eu/energy/sites/default/files/documents/de_final_necp_main_en.pdf

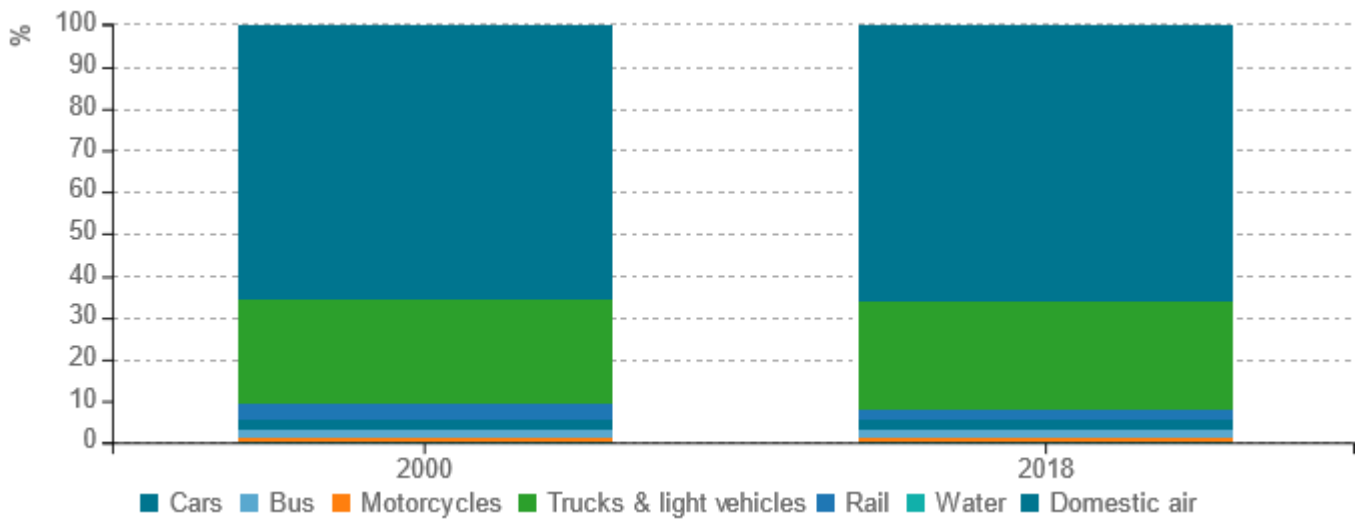
Source: MURE



Transport

Final energy consumption in transport is dominated by cars covering 66% of total consumption in 2018. The share of road freight stayed almost constant (26%), while rail transport dropped from 3.6% to 2.3%. In the same period the share of domestic air traffic, busses and water stayed almost constant.

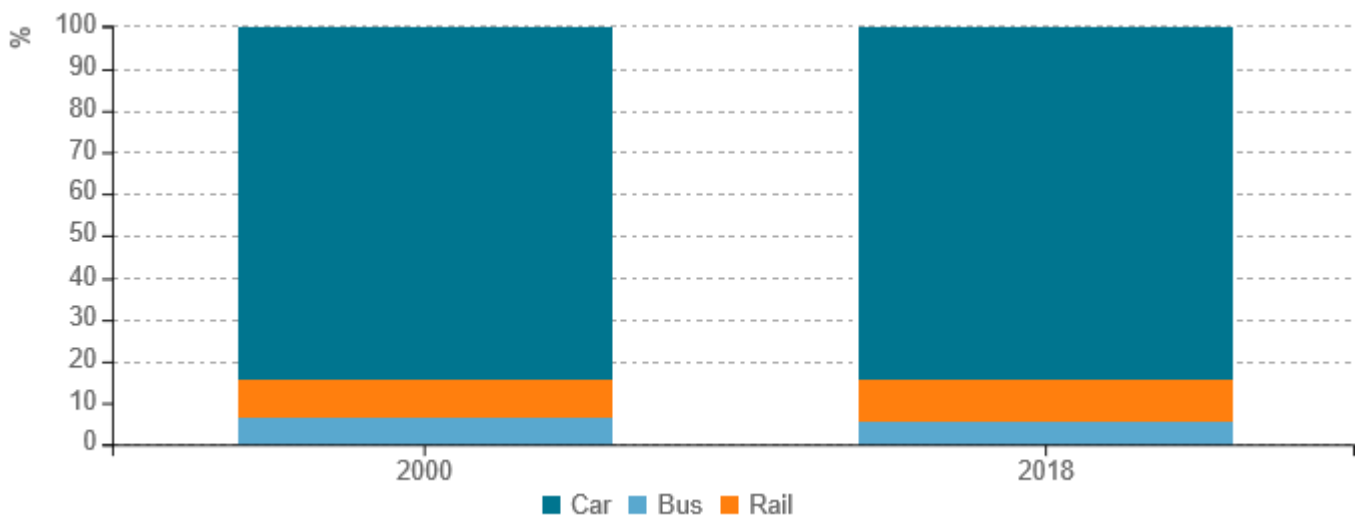
Figure 7: Transport energy consumption by mode



Source: ODYSSEE

Cars represented 84.1% of passenger traffic measured in passenger kilometers in 2018, followed by rail with 10.3% and only 5.5% for bus. The share of cars stayed constant in comparison to 2000, while the share of rail slightly increased by 1.4 percentage points and bus traffic dropped by 1.3 percentage points.

Figure 8: Modal split of inland passenger traffic

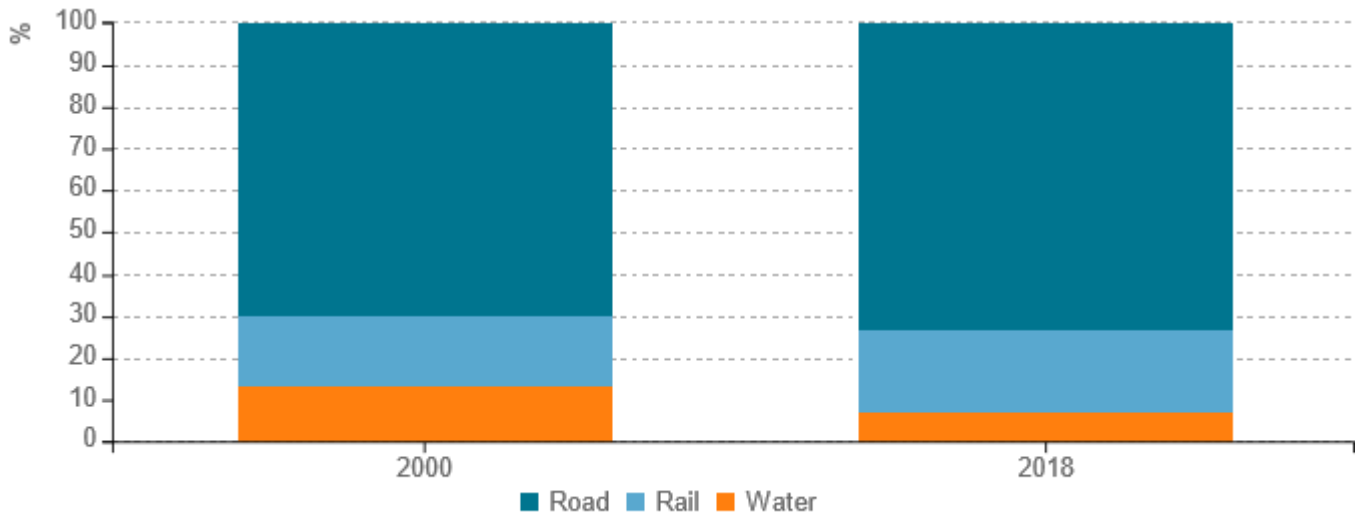


Source: ODYSSEE



Road freight transport represents 73.5% of total freight traffic in 2018, 3.6% points more than in 2000. The share of rail transport in freight increased strongly by 2.9% points, while the share of water traffic decreased by 6.5% points to 7% of total freight transport activity.

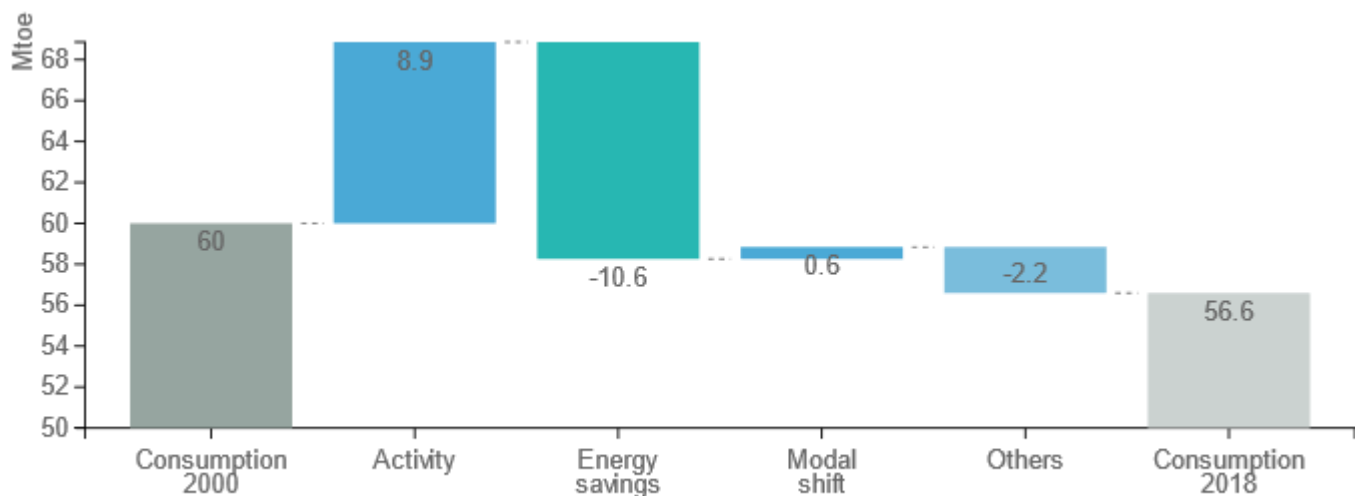
Figure 9: Modal split of inland freight traffic



Source: ODYSSEE

Figure 10 shows the different factors influencing the change in final energy consumption of transport. Germany's total final energy consumption for transport decreased by about 3.4 Mtoe in the period from 2000 to 2018. The increasing traffic of passengers and freight contributed to increase the consumption by 9 Mtoe (activity). This trend was counterbalanced by energy savings (10.6 Mtoe). Modal shift had a slightly increasing effect of 0.6 Mtoe, while other effects resulted in a decrease of about 2 Mtoe.

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



Source: ODYSSEE



The Climate Action Programme 2030 includes bundles of measures addressing different fields of action in the transport sector: (1) public transport, bicycle and pedestrian traffic (2) alternative fuels (3) freight traffic (4) private vehicles (5) commercial vehicles (6) digitalisation. With regard to energy efficiency, especially the following measures are important: (a) Increase in the environmental bonus for the purchase of electric vehicles (b) Funding programme for the purchase of electric buses in local public transport (c) Promotion of energy-efficient and/or low-emission heavy goods vehicles in road haulage companies (d) Heavy goods vehicle toll charges with CO₂ component (e) Reduction of value added tax for long-distance rail travel from 19% to 7% (f) Increase in the Aviation Tax (g) Electricity-based fuels.

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

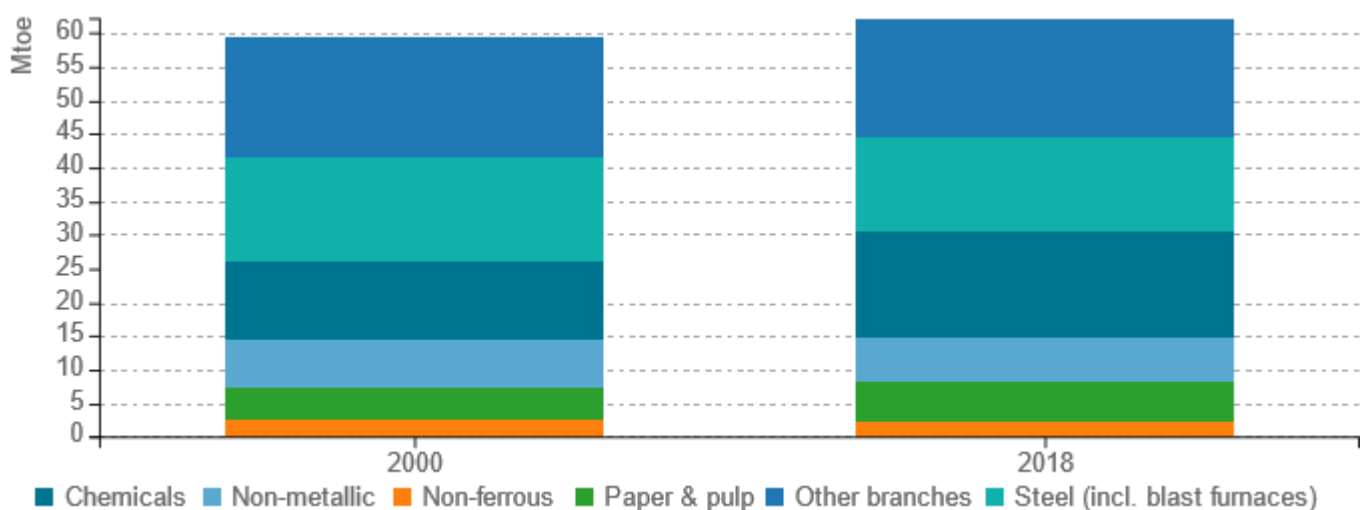
Measures	Description	Expected savings, impact evaluation	More information available
Funding for e-mobility by an environmental bonus	Financial support for the purchase of BEV and PHEV.	2030: 8.8 PJ (net impact without measure interaction effect) / 8.4 PJ (net impact and also taking into account measure interaction)	https://ec.europa.eu/energy/sites/default/files/documents/de_final_necp_main_en.pdf

Source: MURE

Industry

The total consumption of the industry sector increased from 59.3 Mtoe in 2000 to 62.1 Mtoe in 2018 (+5%). Consumption of chemical industry increased by 37 % in this time period, while the energy consumption of the steel producing sector decreased by 10%. Non-ferrous metals' energy consumption decreased by 5%.

Figure 11: Final energy consumption of industry by branch

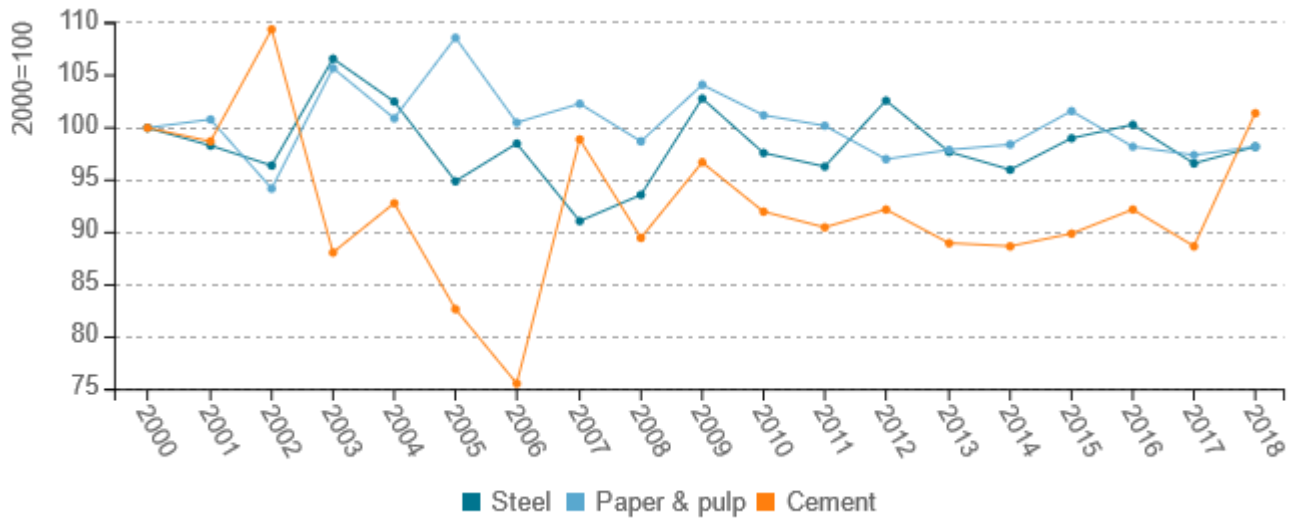


Source: ODYSSEE



Specific consumption of steel, paper and cement production remained at the level of 2000 in 2018, with however some fluctuations, with an increase due to capacity effects during low utilization of production capacities (especially in an economic crisis such for cement in 2006).

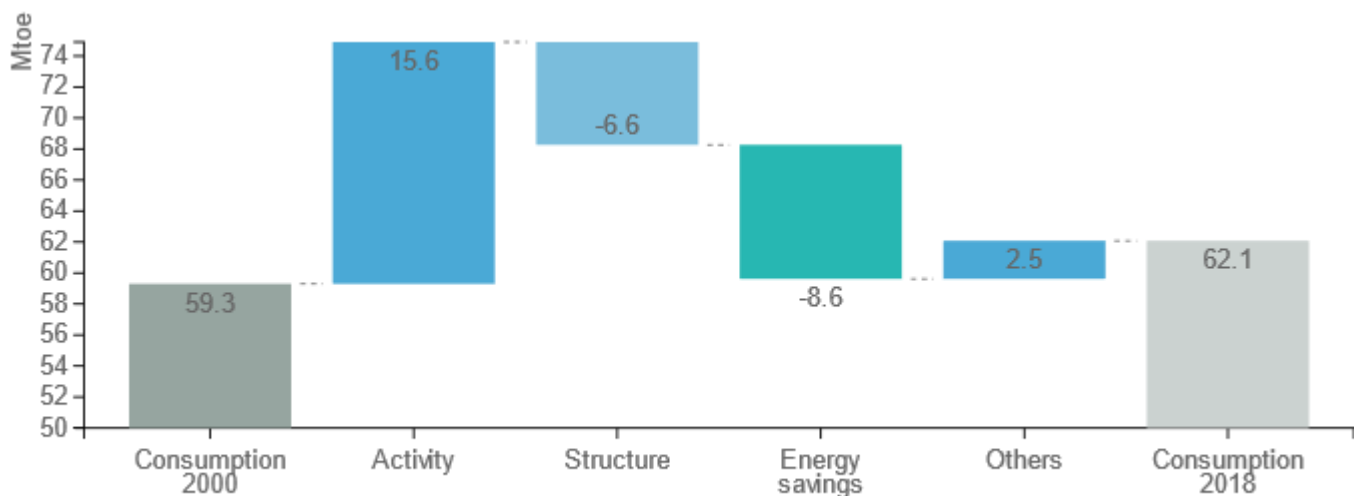
Figure 12: Unit consumption of energy-intensive products (toe/t)



Source: ODYSSEE

Figure 13 shows the factors influencing the changes in final energy consumption of the industrial sector. The increase of its energy consumption by about 3 Mtoe between 2000 and 2018 was mainly driven by change in industrial activity (15.6 Mtoe). This effect was counterbalanced by energy savings (-8.6 Mtoe) and structural changes towards less intensive branches, which increased their contribution in industrial value added (-6.6 Mtoe). Other effects had a relatively minor increasing impact on final energy consumption in industry.

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



Source: ODYSSEE



In 2019, the main funding programmes to improve energy efficiency in companies were improved and merged in two new programmes: (1) Federal Funding for Energy Efficiency in Companies – Subsidy and Credit, comprising 4 modules which take up previous funding programmes (2) Federal Funding for Energy Efficiency in Companies – Funding Competition. In September 2020 the continuation of the Energy Efficiency Networks Initiative and its further development to Efficiency and Climate Networks was agreed between the Federal Government and Industry Associations.

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

Measures	Description	Expected savings, impact evaluation	More information available
Federal Funding for Energy Efficiency in Companies – Subsidy and Credit	Funding of cross-cutting technologies, process heat from renewable energies, control technologies, EMS etc.	2030: 92 PJ (net impact without measure interaction effect) / 87.4 PJ (net impact incl. measure interaction effect)	https://ec.europa.eu/energy/sites/default/files/documents/de_final_necp_main_en.pdf
Energy Efficiency Networks Initiative	Introduction of 500 energy efficiency networks in industry, trade and commerce	2020: 15.8 PJ 2030: 54.3 PJ	https://www.bmwi.de/Redaktion/EN/Artikel/Energy/initiative-energieeffizienz-netzwerke.html

Source: MURE

