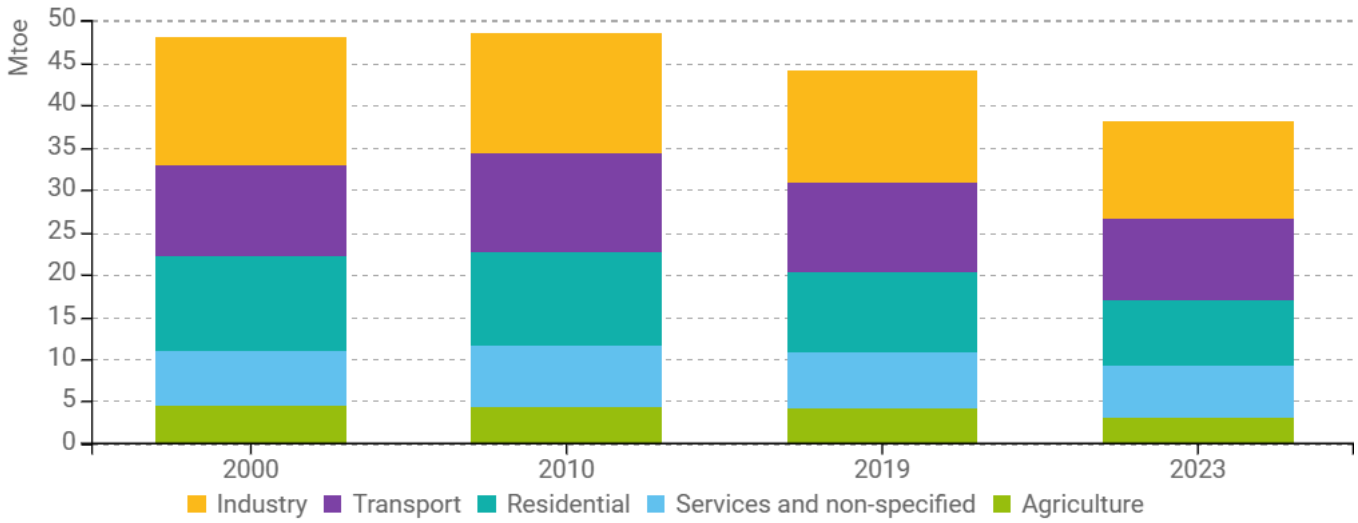
Energy efficiency trends and policies

Overview

Final energy consumption in 2023, corrected for temperature variations, was about 38 Mtoe (see Figure 1). The figure shows the energy consumption in 2019 as a reference, the last 'normal' year before the Covid pandemic and the high energy prices due to the war in Ukraine. The consumption in all sectors was between 8 and 25 percent lower in 2023 than in 2019. Not all of this reduction was due to energy efficiency as we will see later. The 25% lower energy consumption in the agriculture sector, that is dominated by horticulture, was partly a result of the higher energy prices since 2022.

Figure 1: Final energy consumption by sector (with climatic corrections)



Source: ODYSSEE

Efficiency for total final energy consumption, as measured by the so-called technical ODEX, has improved by around 1.5% per year since 2010. This can be derived from the data for the total ODEX as shown in Figure 2. Smaller than average annual gains have been achieved in services (1.3%/year) and especially in transport (0.3%/year). Larger gains were achieved in the residential sector (2.7%/year) and in industry (1.6%/year). The highest efficiency improvement since 2019 occurred in the households sector, which was caused in part by the still high energy prices since 2022.

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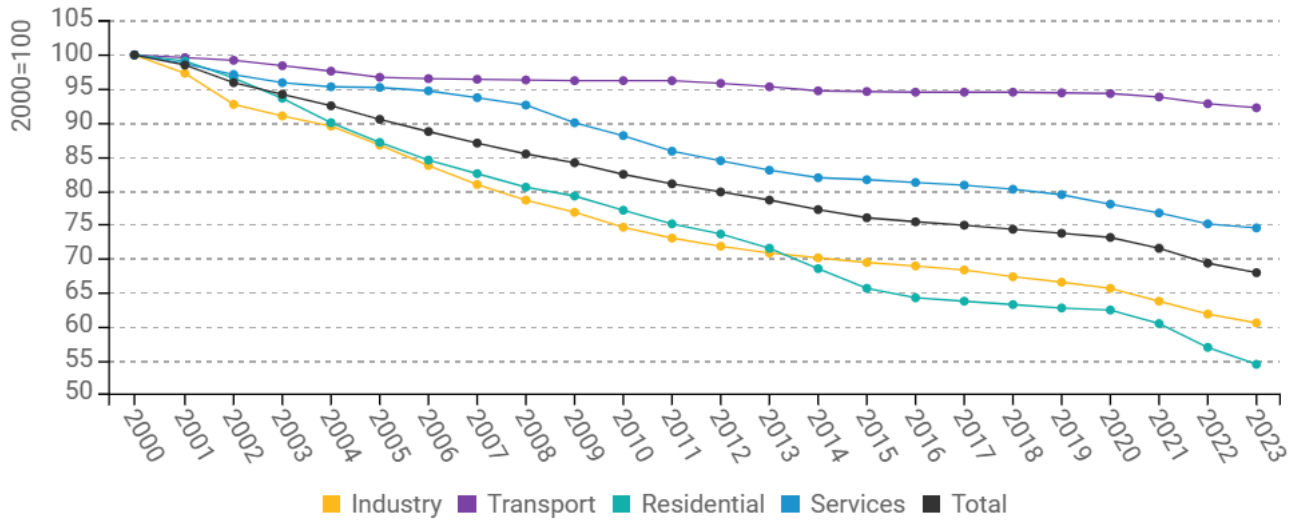
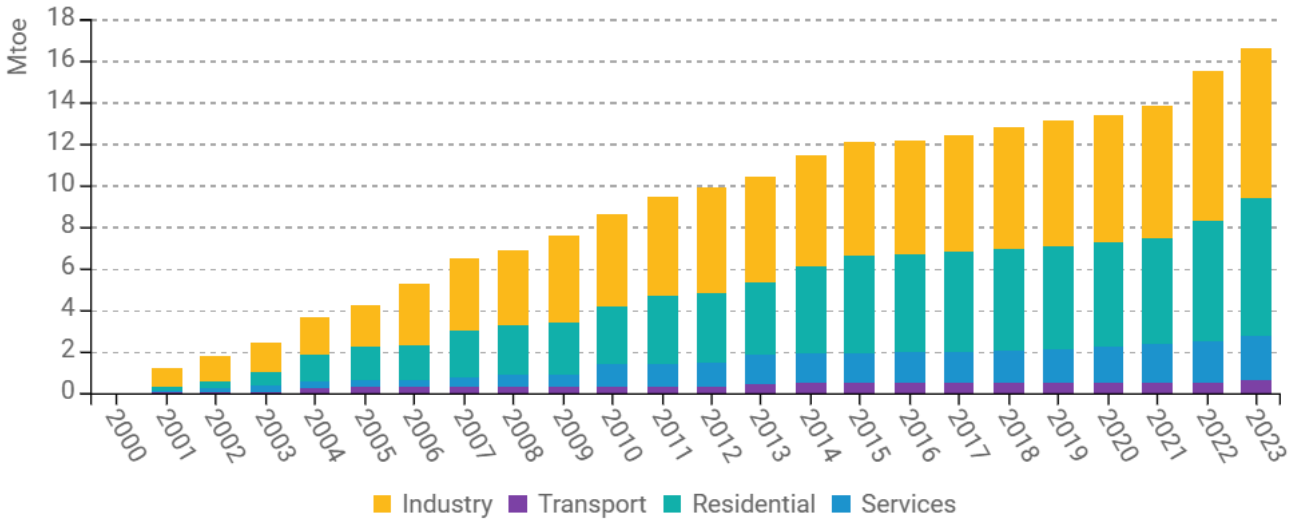
Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Figure 3 shows that cumulative annual energy savings have also been highest in the residential sector and in industry. In the residential sector this was mainly the result of high efficiency boilers and insulation measures. In industry, the results may be distorted by the fact that in the chemical industry, which uses more than half of the final energy in Dutch manufacturing, the industrial production index IPI (based on changes in added value) is used as the production volume. This means that energy savings in the chemical industry seem to improve when higher value products are produced. Again, it is quite clear energy savings in transport are lagging far behind.

Figure 3: Energy savings by sector



Source: Odyssee

Total energy supply decreased by 21 Mtoe between 2010 and 2023. Figure 4 shows that this was the result of a lower final energy consumption (-13.1 Mtoe), consumption of the power sector (-3.8 Mtoe), other transformations

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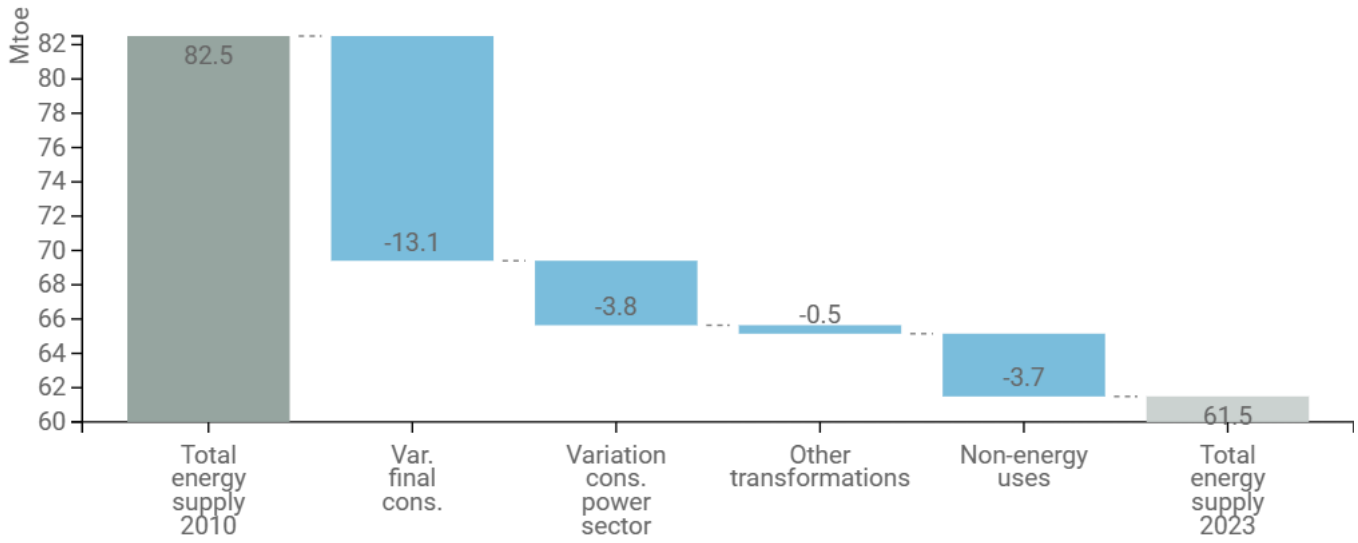
(-0.5 Mtoe) and non-energy use (-3.7 Mtoe). The lower power sector consumption was the result of opposite trends: higher power consumption (+1.1 Mtoe), an increased net export of electricity (+0.6 Mtoe) and a less efficient fuel mix in thermal power plants (a higher share of biomass, +0.9 Mtoe). This was more than mitigated by a higher share of wind and solar (-4.5 Mtoe) and a higher efficiency of thermal power plants (-1.8 Mtoe).

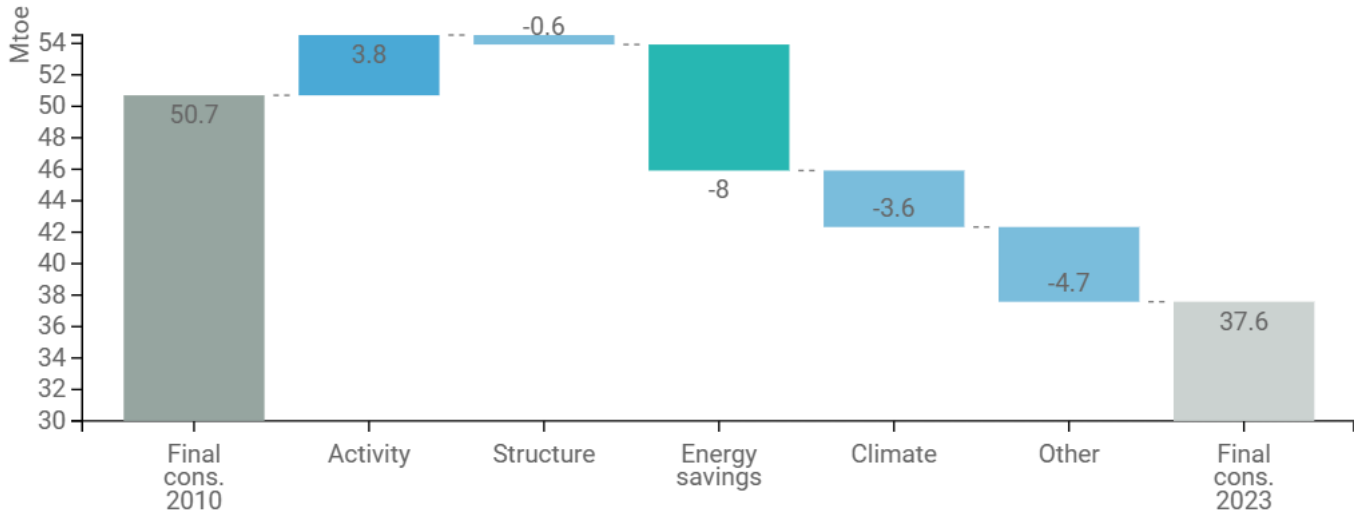
Figure 4: Main drivers of the total energy supply variation



Source: Odyssee

Despite a 7% increase of final energy consumption due to a higher volume of energy consuming activities, total final energy consumption decreased by over 13 Mtoe or 26% between 2010 and 2023, as can be seen in Figure 5. Energy savings more than compensated the increasing effect of activities. A slightly less energy-intensive structure of the economy, higher temperatures and "other" effects, which include behavioural change, led to a comparable decrease of final energy consumption.

Figure 5: Main drivers of the final energy consumption variation



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Source: Odyssee

The Netherlands aims to be part of a climate-neutral Europe in 2050. In order to achieve climate-neutrality in 2050, the Dutch national interim target for 2030 has been tightened to at least a 55% net greenhouse gas reduction in 2030 compared to 1990. Many of the current and proposed greenhouse gas mitigation measures will stimulate energy efficiency. However, for the Netherlands, energy efficiency will also be directly addressed through the implementation of the EU Energy Efficiency Directive (EED). As part of the Fit for 55 Agreement, the EED makes it binding for EU countries to collectively ensure an additional 11.7% reduction in energy consumption by 2030, compared to the 2020 reference scenario projections. Some general measures with high impact are described in the table below.

Table 1: Sample of cross-cutting measures

Measures	NECP measures	Description	Expected savings, impact evaluation
Energy Tax	Yes	The energy tax is levied on electricity and natural gas, and the level depends on the level of energy consumption of a customer (degressive tariff structure).	
Energy Investment Allowance (EIA)	Yes	The Energy Investment Allowance (EIA) is a fiscal measure that offers the possibility of an additional allowance on taxable profit. EIA applications can be made for the purchase of designated energy efficient equipment. The Minister of Climate and Green Growth annually compiles an 'energy list' for that purpose in the EIA Implementing Regulation, which details the equipment that is eligible for an allowance.	
Energy saving and reporting obligation	Yes	The energy saving obligation requires that companies which consume in excess of 50000 kWh of energy or 25000 m3 of gas adopt energy saving measures with a payback time of 5 years or less. Since 2019, a mandatory reporting of measures taken was introduced (Informatieplicht)	

Source: MURE

Buildings

As can be seen in Figure 6, the energy consumption of the built environment decreased between 2010 and 2023; it increased between 2000 and 2010 because of more energy use in the services sector. In contrast, the consumption in the households sector showed a more consistent decreasing trend between 2000 and 2023, with a large decrease between 2019 and 2023.

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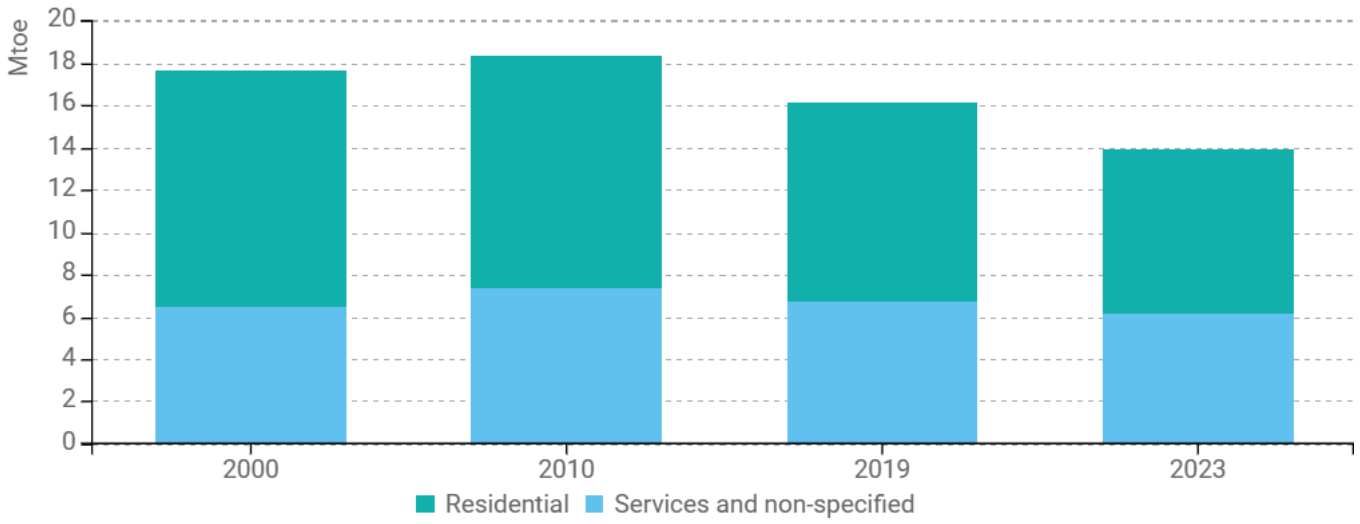
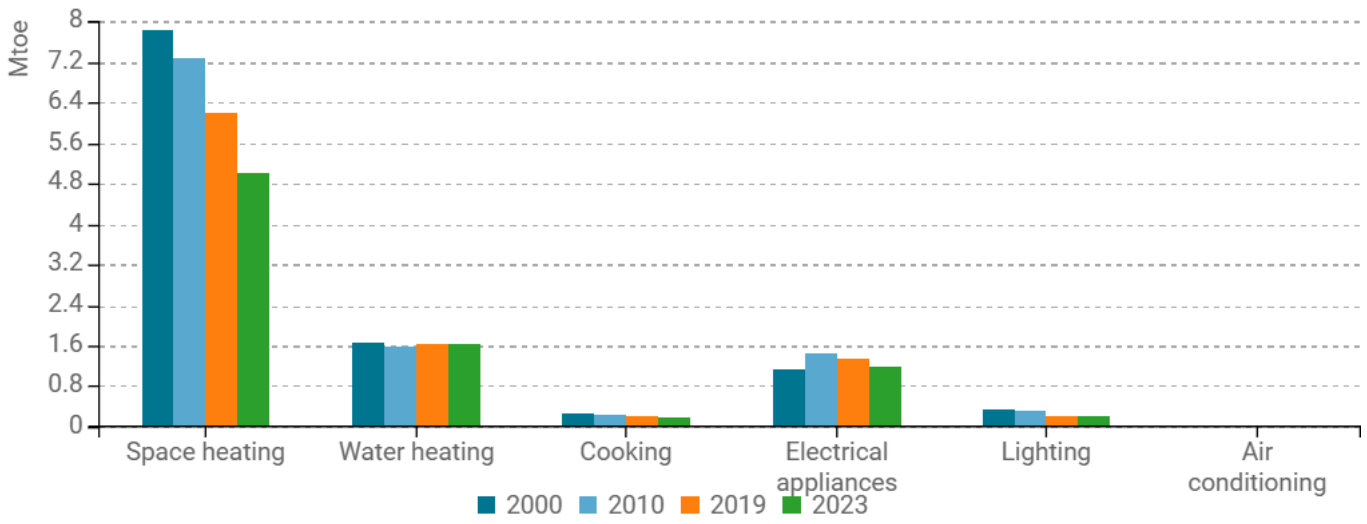
Figure 6: Final energy consumption in buildings (with climatic corrections)



Source: Odyssee

Figure 7 shows that the large majority of energy consumption reduction in households was achieved in space heating. Electrical appliances still used a bit more than in 2000 despite a decreasing trend since 2010. Energy consumption for water heating stayed about the same since 2000. Lighting and cooking used less than in 2000.

Figure 7: Energy consumption by end-use of households (with climatic corrections)



Source: Odyssee

The energy used for space heating per square meter in households has decreased steadily until 2015 as shown in Figure 8. A large part of the reduction is due to better insulation and a bigger share of high efficiency condensing boilers. Between 2015 and 2021, energy consumption per square meter remained roughly at the same level. The decrease in 2022 is related to the high energy prices in 2022, which was related to the war in Ukraine. This led to

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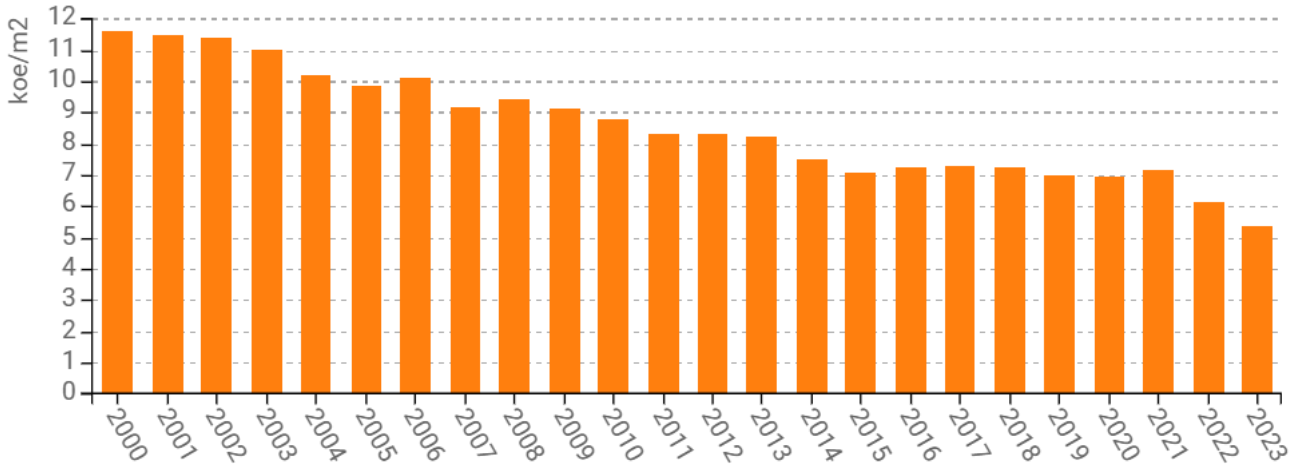
more economical heating behaviours. The decreasing trend continued in 2023, partly due to gas prices which remained high.

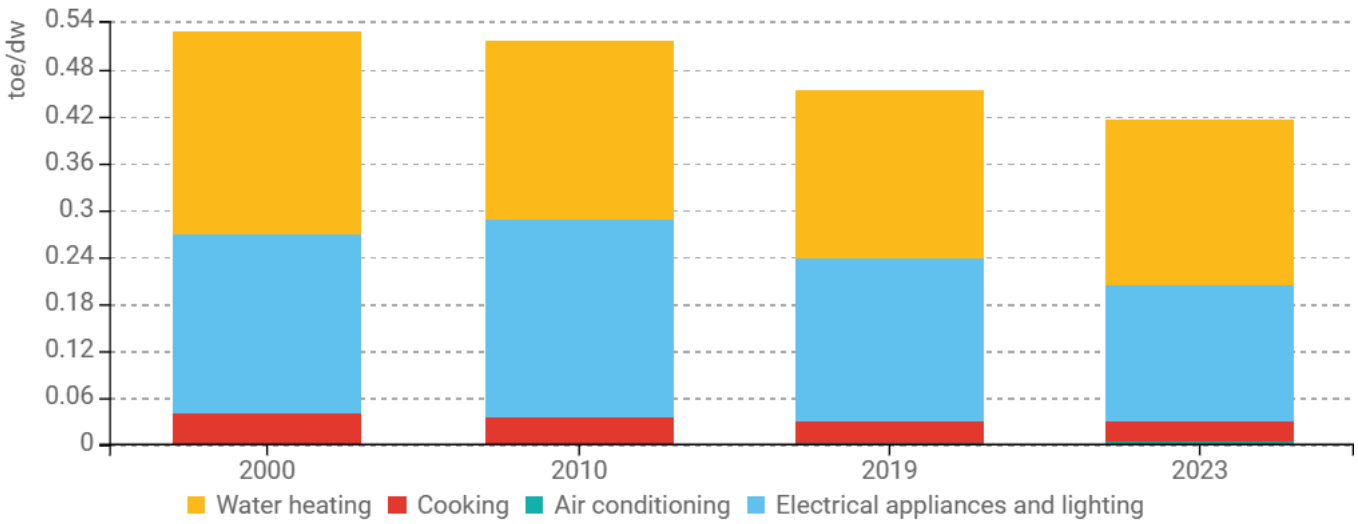
Figure 8: Energy consumption of household space heating per m2 (with climatic corrections)



Source: ODYSSEE

The reduction of energy consumption per dwelling for other uses than space heating is depicted in Figure 9. The energy used for water heating has decreased consistently between 2000 and 2023. The consumption by electrical appliances and lighting decreased after 2010 despite a higher number of electrical appliances because of increased efficiency. The improved efficiency of appliances can for a large part be attributed to the Ecodesign directive. The lower energy consumption for cooking is partly related to a higher share of electrical stoves. Energy consumption of air conditioning remained low.

Figure 9: Energy consumption per dwelling by end-use (except space heating)



Source: ODYSSEE

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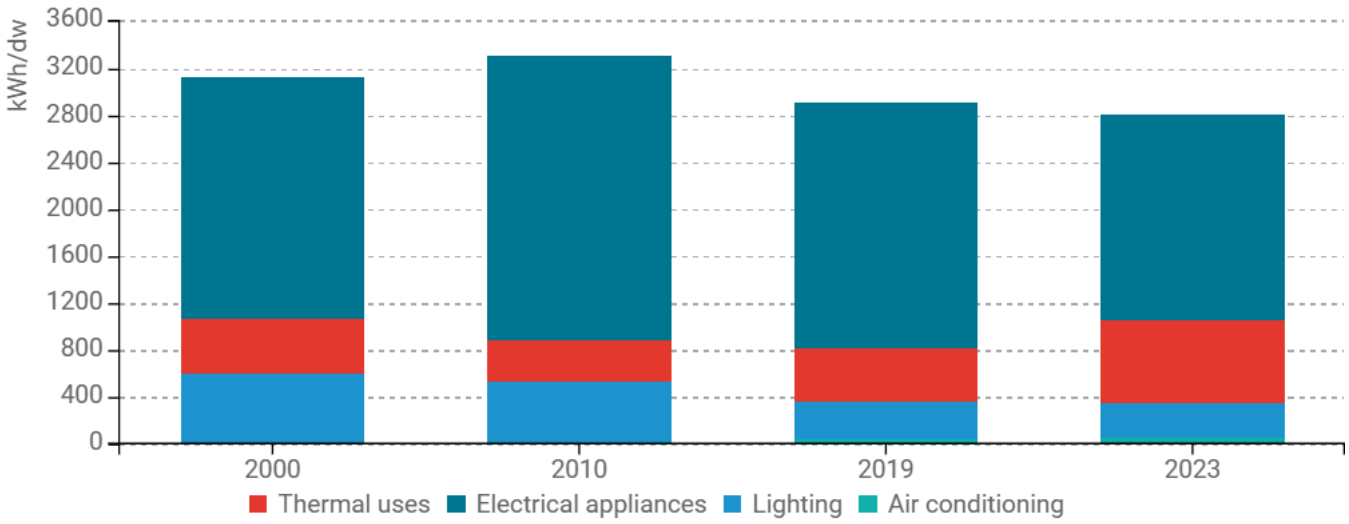
The different uses of electricity consumption per dwelling are shown in Figure 10. Electrical appliances use the majority of electricity. They have become consistently more efficient since 2000, especially after the introduction of the Ecodesign directive, as has lighting. Thermal use has gone up because of a larger number of heat pumps.

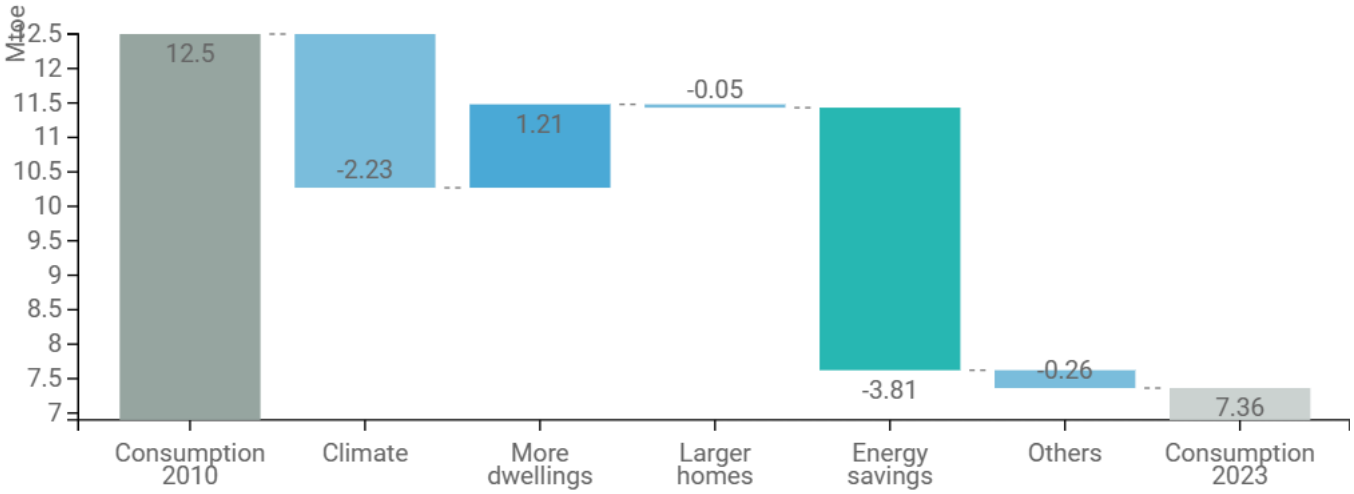
Figure 10: Electricity consumption per dwelling by end-use (with climatic corrections)



Source: Odyssee

Figure 11 shows that the total energy consumption in the households sector has decreased between 2010 and 2023, despite a larger number of dwellings. This volume effect was compensated by three times larger energy savings, mainly by insulation and more efficient heating systems. Higher ambient temperatures also reduced energy demand considerably. 'Other' effects lowered energy consumption as well. These include more economical heating behaviour, which is linked to higher energy prices especially in 2022, but also still in 2023.

Figure 11: Main drivers of the energy consumption variation in households



Source: ODYSSEE

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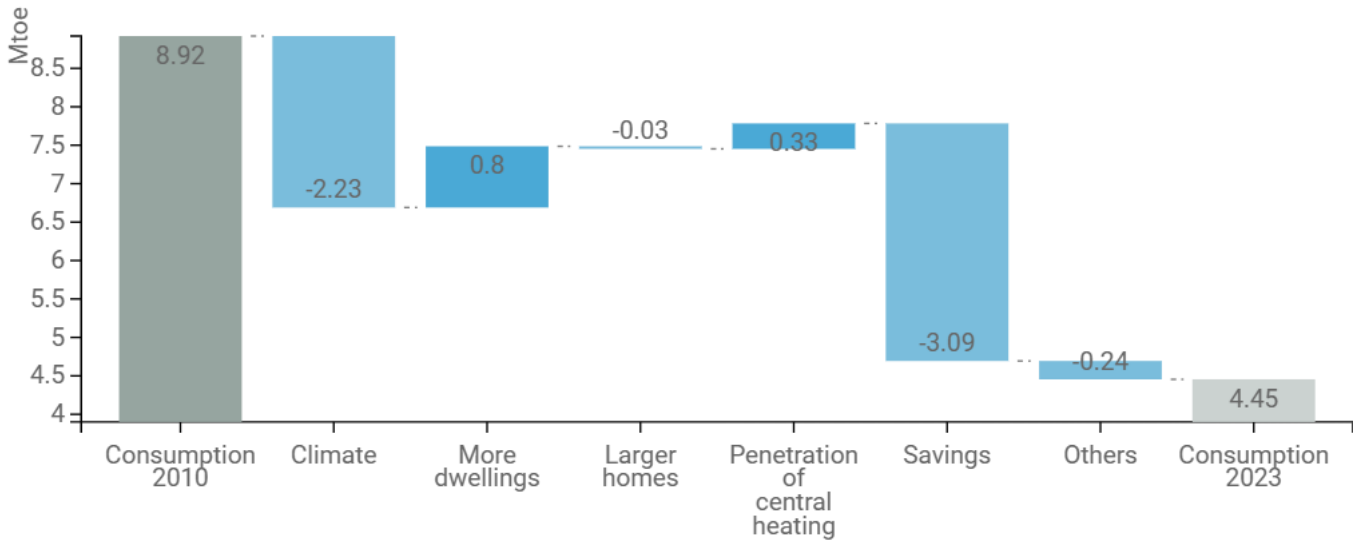
Figure 12 shows the same decomposition pattern of energy use for space heating in dwellings as Figure 11 shows for the total energy consumption. This is an indication of the fact that space heating dominates energy consumption in dwellings as well as energy savings.

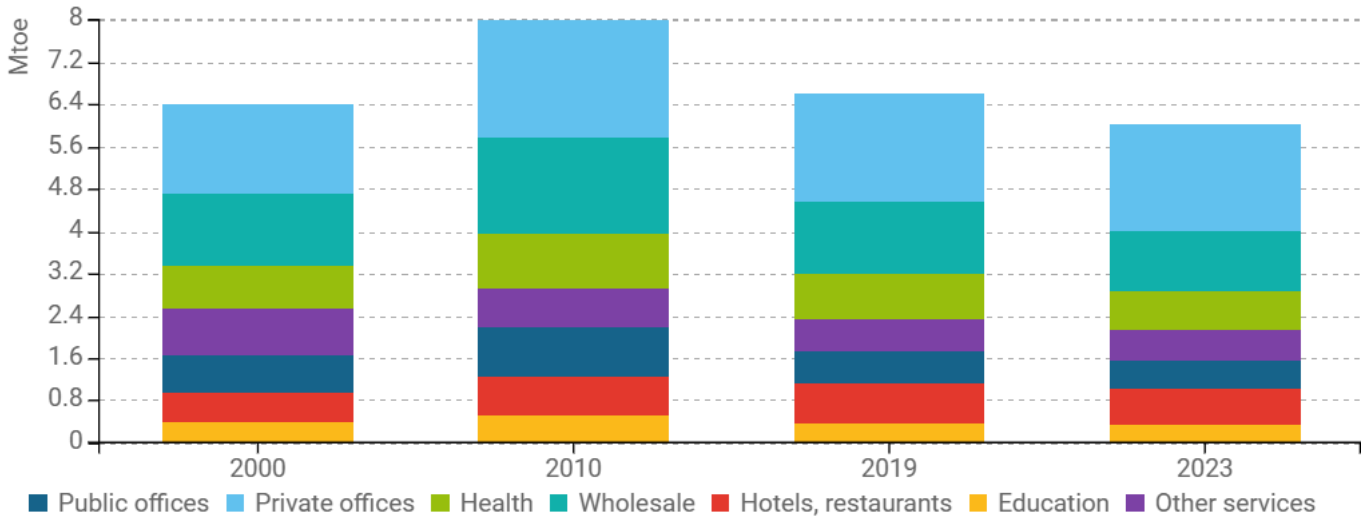
Figure 12: Main drivers of the space heating consumption variation of households



Source: Odyssee

Energy consumption in the services sector has been decreasing since 2010, as reflected in Figure 13. Consumption went down in all sectors, continuing this trend after 2019. Relative reductions of energy consumption were lowest in Private offices and Hotels and restaurants.

Figure 13: Final energy consumption of services by branch



Source: Odyssee

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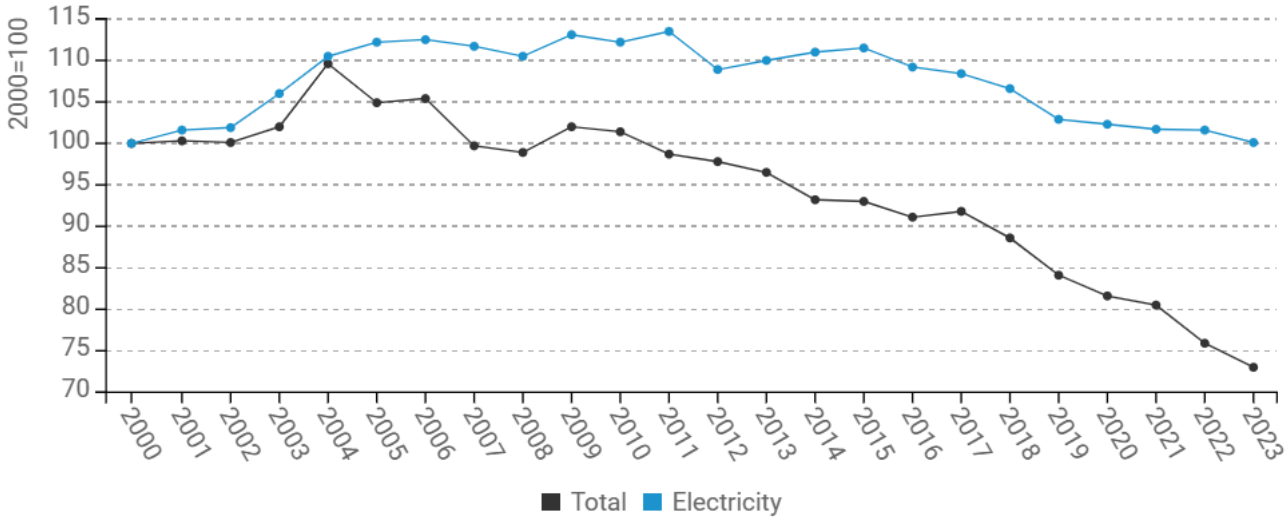
Total energy consumption per employee in the services sector decreased, while that of electricity returned to the level of 2000 in 2023, as shown in Figure 14. The net savings are thus the result of savings on energy consumption for space heating by insulation and by more efficient heating and of behavioural change.

Figure 14: Energy and electricity consumption per employee in services (with climatic corrections)



Source: ODYSSEE

In line with the Netherlands' broader energy and climate policy, the sustainability of the built environment is primarily focused on CO2 reduction. The current target for the built environment, agreed to as part of a policy package in April 2023 ("Voorjaarsbesluitvorming Klimaat") is an emission ceiling of 13.2 Mt of CO2-equivalents in 2030. The core of the Dutch approach in the built environment is reducing energy demand through behaviour, insulation and hybrid heat pumps, and developing sustainable heat sources to meet the remaining demand. This happens via multiple tracks simultaneously: both through an area-oriented approach via municipalities (based on heat transition visions, district implementation plans, and energy fix teams in response to energy poverty) and with policy for individual homes and buildings (on topics such as energy labeling, nearly zero-emission buildings, public building renovation). Some measures with high impact in the built environment are described in the table below.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
National Performance Agreements (NPA) with	Yes	The Ministry of Housing and Spatial Planning made national performance agreements with the branche organisation for housing corporations (Aedes), tenant interest organisation Woonbond, and Dutch municipalities (VNG). The core of these agreements includes the construction of new homes, making the	

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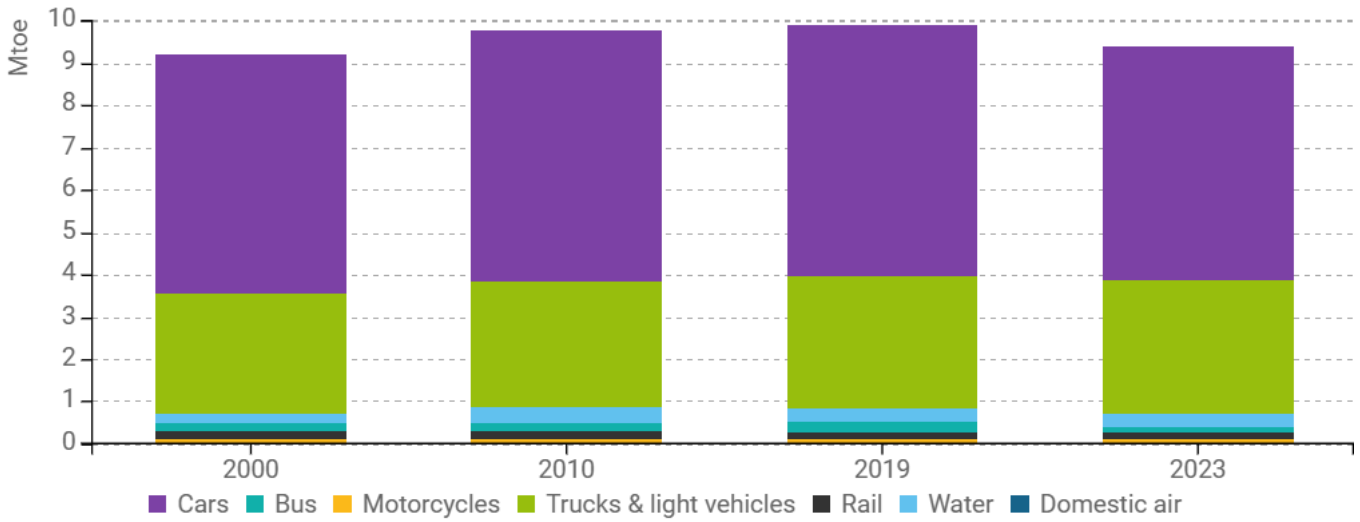
Housing Corporations		housing stock more sustainable, affordability measures, and improving the quality of life.	
Investment Subsidy for Sustainable Energy (ISDE)	Yes	Households and small commercial users can apply for an allowance for the purchase of heat pumps, biomass boilers, solar water heaters, pellet stoves and small wood-fired boilers.	
Subsidy scheme for sustainable social real estate (DUMAVA)	Yes	Owners of existing social real estate can receive a subsidy to pay the costs of making their property more sustainable. Subsidies are available for energy advice, an energy label and sustainability measures for owners of social real estate and parties involved in making social real estate more sustainable (such as schools, government buildings, healthcare institutions or national monuments).	

Source: MURE

Transport

The main reason for the lower consumption of domestic transport in 2023 compared to 2019 as depicted in Figure 15 is the lower consumption of cars. Energy consumption levels of other transport modalities remained about the same.

Figure 15: Transport energy consumption by mode



Source: ODYSSEE

Figure 16 shows a slowly decreasing share of passenger traffic by car (from 88% to 85%), a more or less stable share by bus (about 3%) and an increasing share by rail (from 9% to 12%) between 2000 and 2023.

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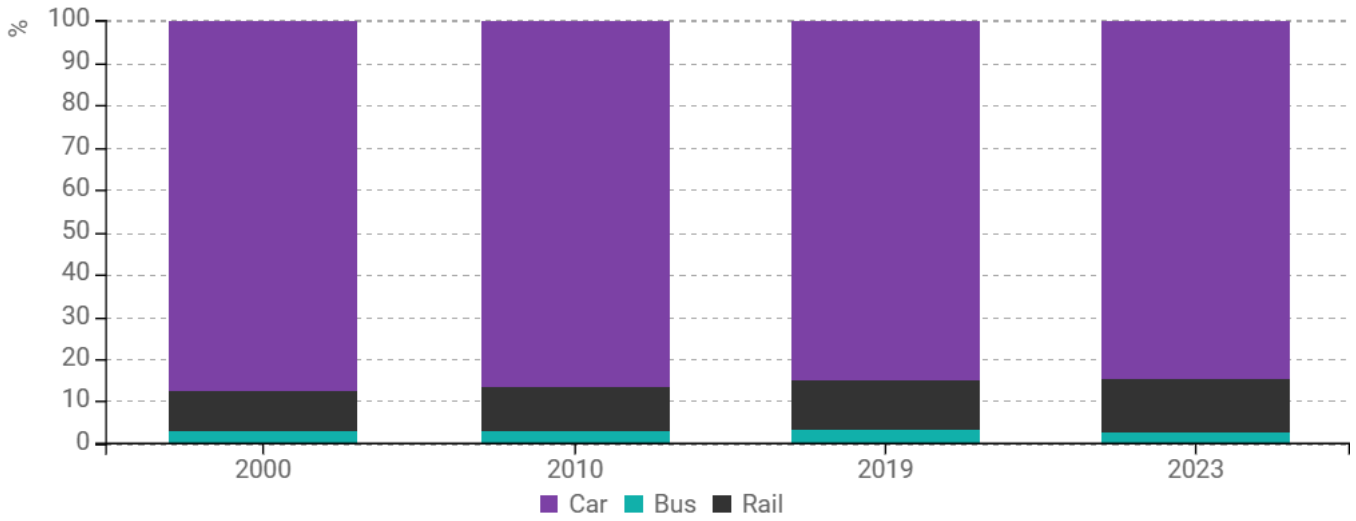
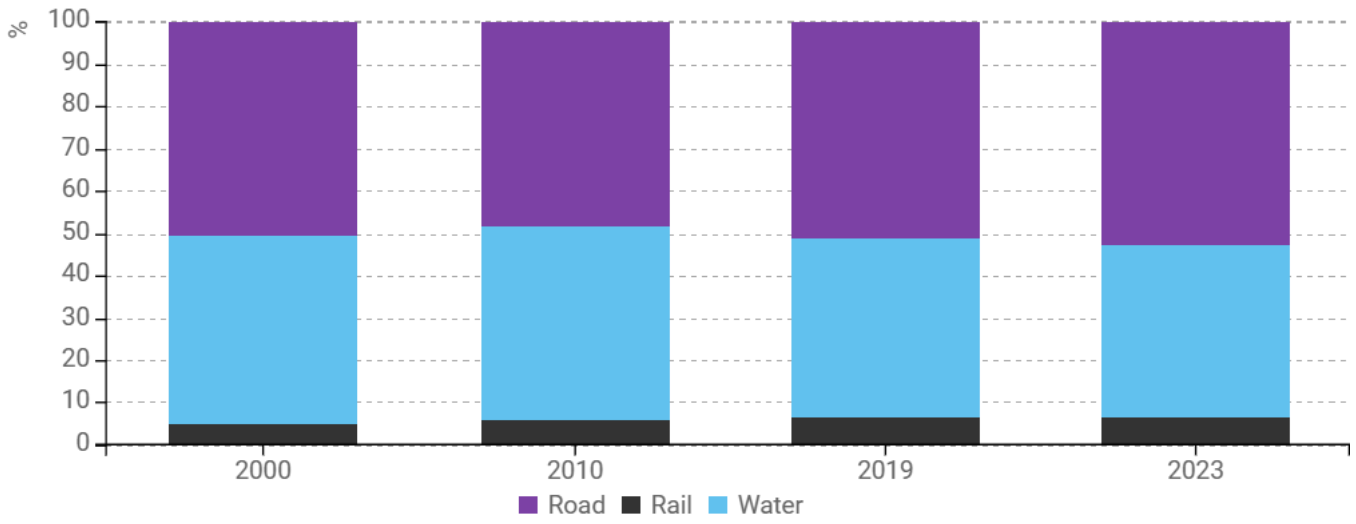
Figure 16: Modal split of inland passenger traffic



Source: ODYSSEE

The share of road freight traffic has been increasing from 48% in 2010 to 53% in 2023 of total freight traffic measured in ton-kilometer as shown in Figure 17, while the share of freight traffic by water decreased from 46% to 41%. The share of freight traffic by rail has been growing from 5% in 2000 to 6% in 2023.

Figure 17: Modal split of inland freight traffic



Source: ODYSSEE

The slowly decreasing trend in energy consumption per passenger-kilometer of cars since 2010 has stopped after 2019, as can be concluded from the slightly higher consumption per km in 2023 in Figure 18. This may be the result of an increasing average size, weight and thus energy consumption of cars, which compensates more efficient internal combustion engines and the increasing share of the much more efficient but also much heavier electric cars.

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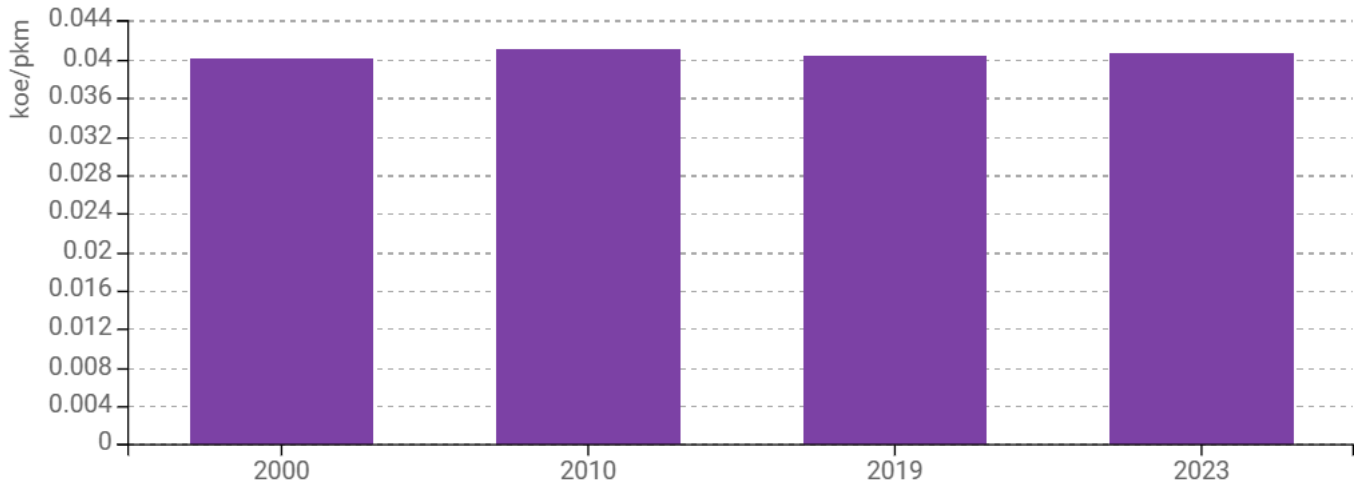
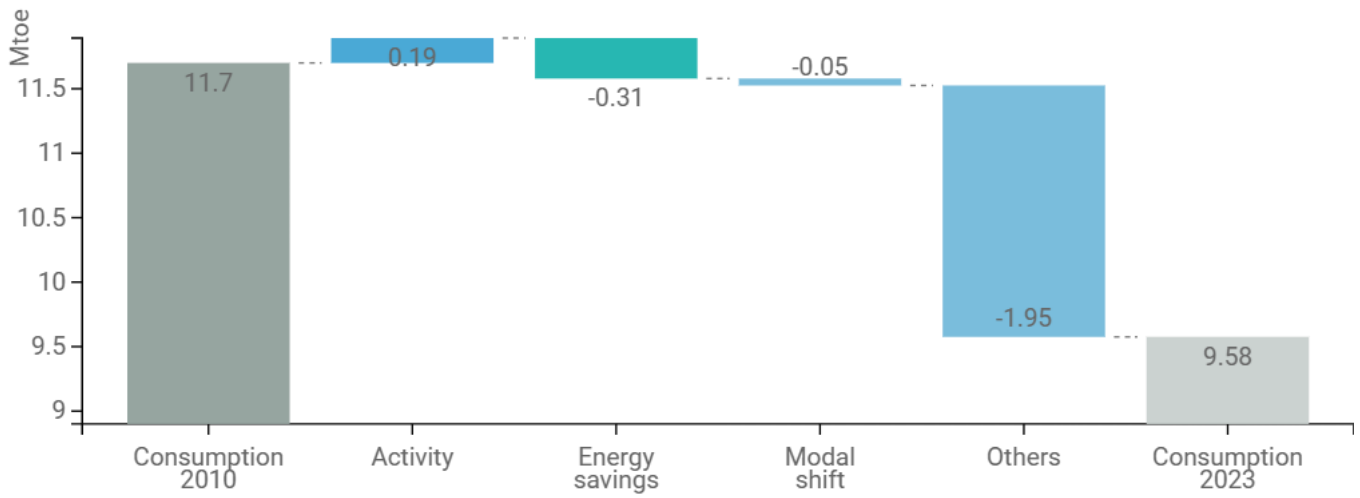
Figure 18: Energy consumption of cars per passenger-km



Source: ODYSSEE

As shown in Figure 19, the energy consumption of transport in 2023 was 2.1 Mtoe lower than that in 2010, despite higher levels of activity (i.e. more traffic). Energy savings more than compensated the growth in transport activity, but the largest reduction came from "Others". This may still partly be the effect of a lower number of passenger kilometers by car since the start of the Covid pandemic in 2020.

Figure 19: Main drivers of the energy consumption variation in transport



Source: ODYSSEE

The current target for the sector, agreed to in April 2023 ("Voorjaarsbesluitvorming Klimaat") is an emission ceiling of 21,0 Mt of CO2-equivalents in 2030.Resources have been made available for charging infrastructure and policies to incentivise private use of electric passenger cars. Activities within the logistics pillar include zero-emission zones for city logistics and subsidies for zero-emission road transport for company cars, trucks, construction vehicles and

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public transportation. The use of biofuels in road traffic will be increased for use by transport modes with few alternatives, such as heavy road transport.Some measures representative of this approach are described below.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Vehicle taxes (Motor Vehicle Tax/Private Car and Motorcycle Tax, CO2 differentiation, lease cars)	Yes	Various taxes exists for vehicles: a car registration tax (BPM) and tax for car owners (MRB). For company cars income surcharges apply. Zero-emission vehicles are stimulated using tax exemptions and lower surcharges.	
Subsidy Hydrogen in Mobility (SWiM)	No	The Hydrogen in Mobility (SWiM) subsidy program is aimed at companies investing in hydrogen within a collaborative framework. This collaboration—a consortium—must include at least one operator of a hydrogen refueling station and at least one company that operates as a carrier.The target groups for this program include the transport and distribution sector (including small and medium-sized enterprises), operators of hydrogen refueling stations, shippers (producers transporting their goods), and passenger transport services (such as buses and wheelchair transport with a minimum of five seats).	
Private Charging Infrastructure at Businesses Subsidy Scheme (SPRILA)	No	The Private Charging Infrastructure at Businesses Subsidy Scheme (SPRILA) encourages investments aimed at accelerating the rollout of private charging infrastructure for electric vehicles at companies.	

Source: MURE

Industry

One third of the decrease in energy consumption in industry between 2000 and 2023 as shown in Figure 20 was due to a reduction of 1.3 Mtoe in "Other branches" (which includes a sizable food industry). The second largest reduction, of 0.9 Mtoe, occurred in the chemical industry.

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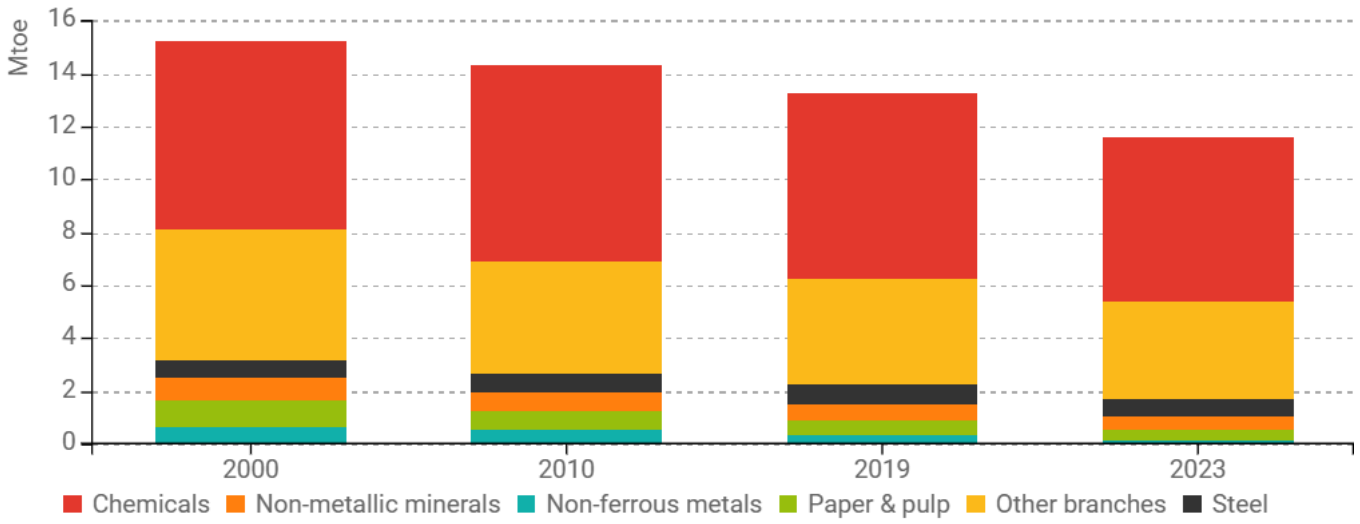
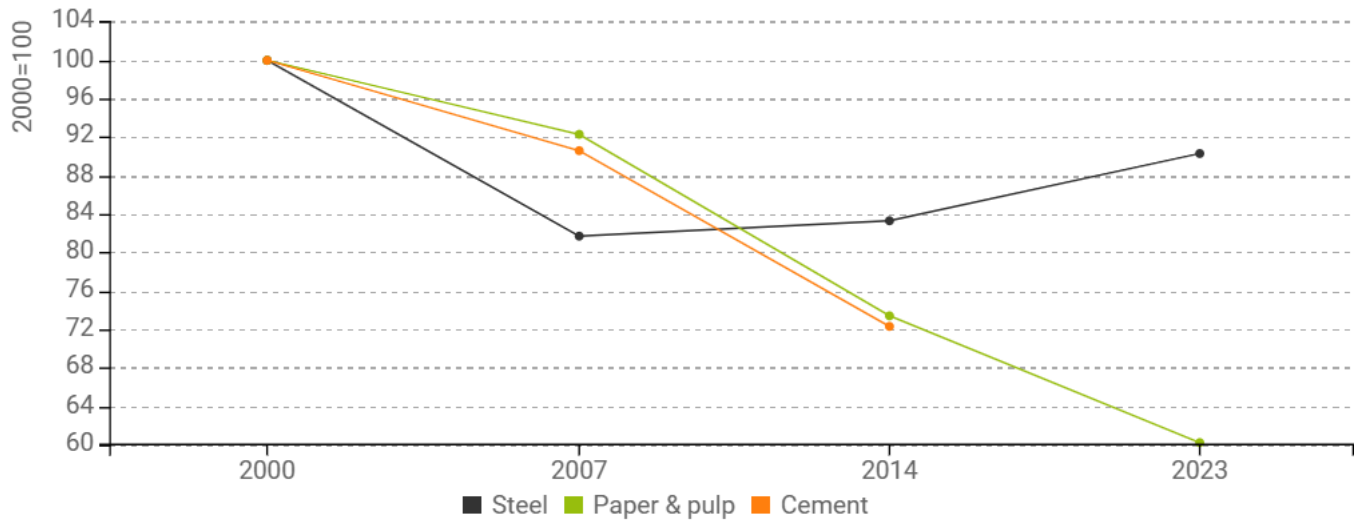
Figure 20: Final energy consumption of industry by branch



Source: ODYSSEE

As shown in Figure 21, the unit energy consumption in the paper industry has decreased by 40% since 2000. This is the result of efforts to decrease the energy consumption of the paper drying process. Steel production in 2023 was 10% more efficient compared to 2000, but has become less efficient compared to 2007.

Figure 21: Unit consumption of energy-intensive products (toe/t)



Source: ODYSSEE

The decomposition of the energy consumption in industry in Figure 22 shows that the energy consumption in 2023 was lower than in 2010, despite slightly higher activity (more production). Structural effects led to lower consumption, but efficiency was the main reason. The savings may be overestimated by the fact that the industrial production index is used as activity level in the (large) chemical industry. Thus, producing higher value products may have distorted the reported savings.

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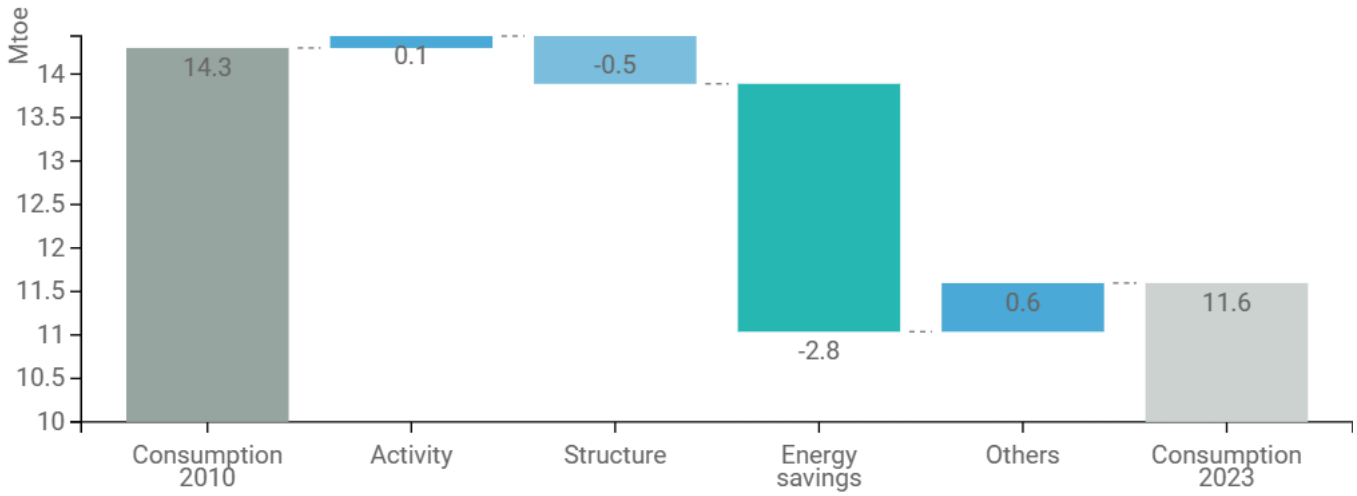
Figure 22: Main drivers of the energy consumption variation in industry



Source: ODYSSEE

The emission ceiling target for the industry sector, agreed to in April 2023 ("Voorjaarsbesluitvorming Klimaat") is 29,6 Mt of CO2-equivalents in 2030. Companies in the industrial sector are obligated to focus on energy conservation and electrification through regulatory means, such as the cross-sectoral Energy saving and reporting obligation, and supported with different economic and fiscal measures and a coordinating role from the government in resolving infrastructural bottlenecks.A number of representative measures are mentioned below.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Sustainable Industry Infrastructure Program (PIDI) & Multi-Year Program Infrastructure Energy and Climate (MIEK)	Yes	The Sustainable Industry Infrastructure Program (PIDI) focuses on accelerating decision-making in the energy infrastructure of national importance for the timely sustainability of basic industry in the Netherlands. PIDI includes a Multi-Year Program Infrastructure Energy and Climate (MIEK), in which stakeholders make agreements about the main infrastructure for sustainable industry.	
Green Investment and	Yes	The Environmental Investment Allowance (MIA Milieu Investerings Aftrek) and Random Depreciation of Environmental Investments (VAMIL Vrije Afschrijving Milieuinvesteringen) are two related	

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Finance (MIA,Vamil)		deduction schemes from fiscal profits to promote investments in new environmental technologies.	
Accelerated Climate-related Investments in Industry (VEKI)	Yes	The VEKI subsidy scheme offers subsidy possibilities for investment projects in emission reduction technologies in industry that have passed development and demonstration, but still have high investment demands and pay back times in excess of 5 years. Eligible projects include e.g. investments related to energy efficiency, recycling of waste, local infrastructure and/or other CO2 reduction technologies	

Source: MURE

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