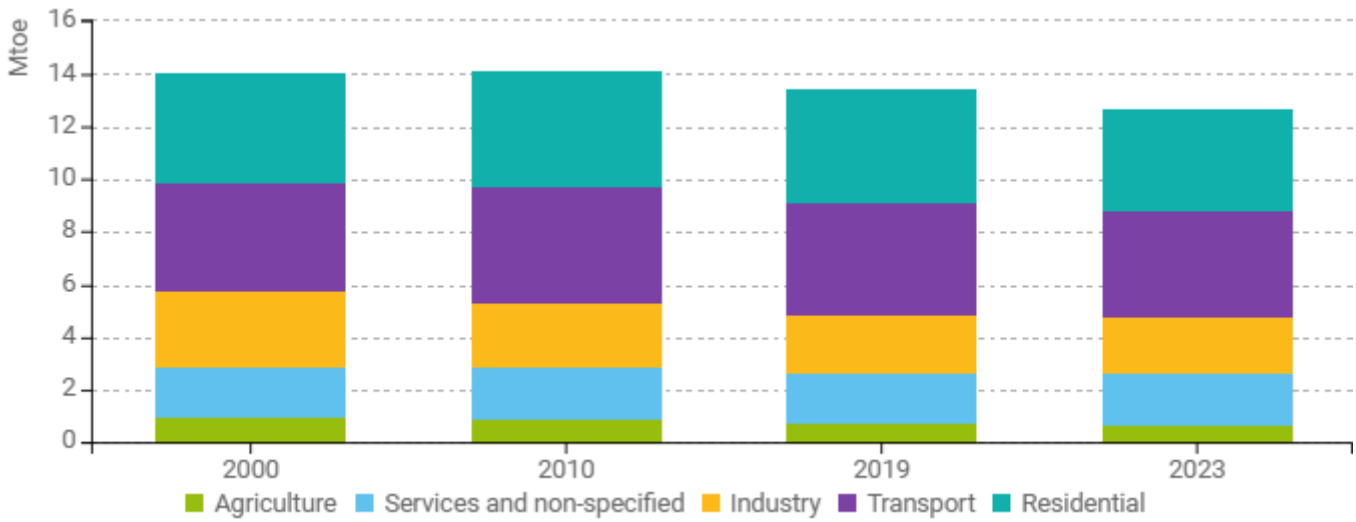
# Energy efficiency trends and policies

## Overview

In 2023 total final energy consumption was 0.8% lower than in 2010 (normal climate). Energy consumption decreased in all sectors. Residential sector consumption has decreased 1.0% from 4.4 Mtoe in 2010 to 3.9 Mtoe in 2023. Transport sector (excl. international air transport) decreased 0.7%from 4.4 Mtoe in 2010 to 4.02 Mtoe in 2023. The industry sector has decreased by 0.9%, from 2.4 Mtoe in 2010 to 2.1 Mtoe in 2023.The energy consumption in the service sector has decreased less, 0.3%, from 2.0 Mtoe in 2010 to 1.9 Mtoe in 2023.

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




Source: ODYSSEE

Energy efficiency of final consumers, as shown by ODEX, improved by an average of 1.3%/year from 2000 to 2023 (or 26% in total). Most improvement has been registered in industry and residential sectors.

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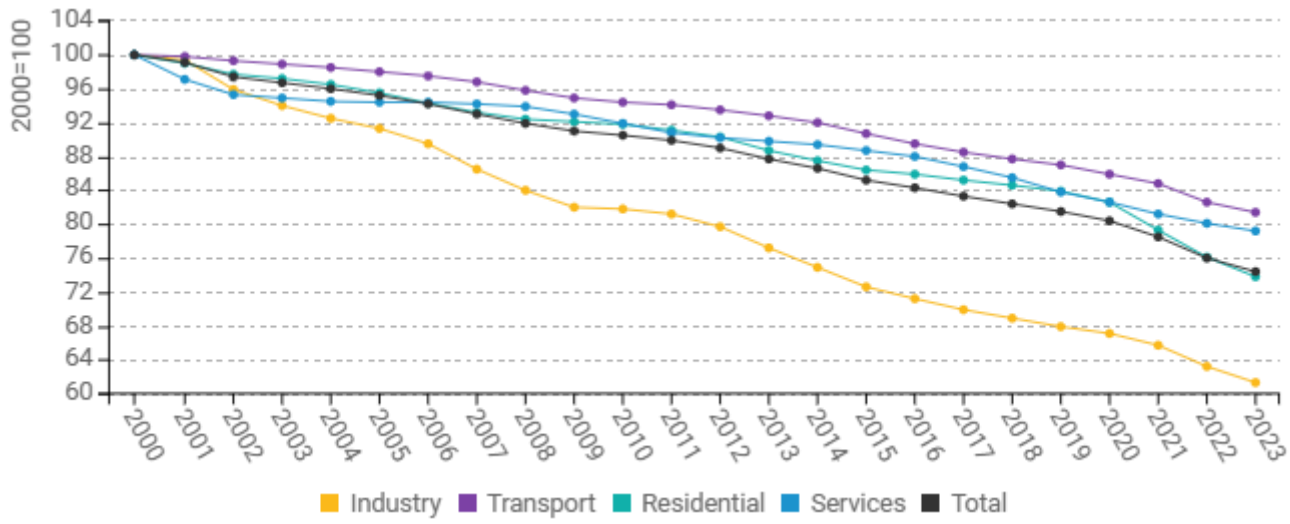
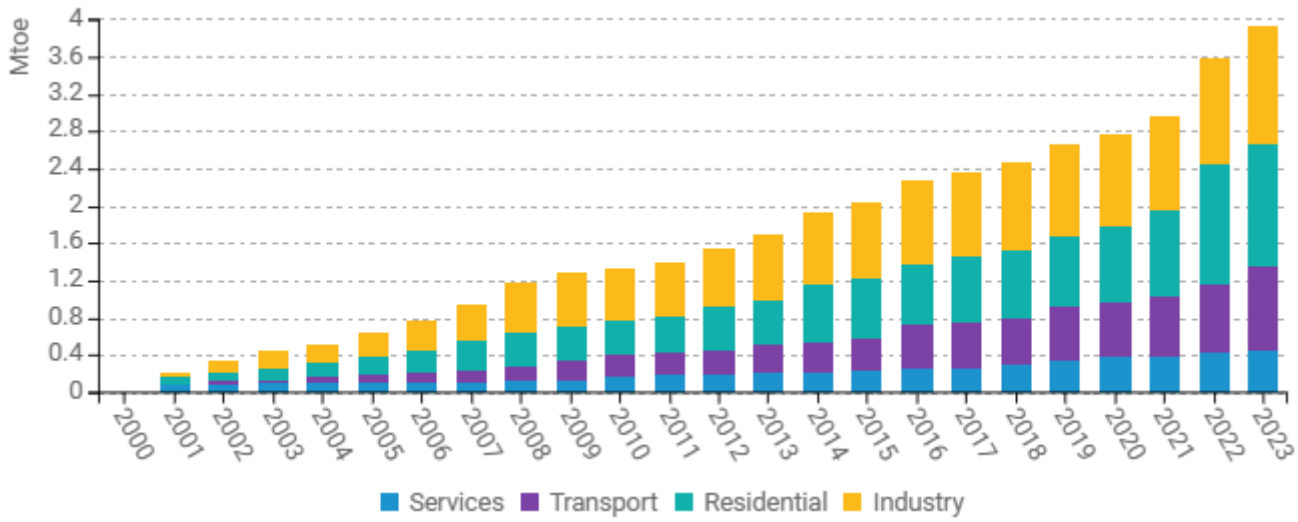
*Figure 2: Technical Energy Efficiency Index*




Source: ODYSSEE

There are increasing energy savings in all sectors through the years and energy savings have rised significantly in 2022 and 2023, which could be related to the higher energy prices in this period. Most improvement has been registered in industry and residential sectors, followed by the transport sector.

*Figure 3: Energy savings by sector*




Source: Odyssee

The main driver of the total energy supply reduction from 2010 to 2023 is the decrease in final energy consumption followed by the decrease in the electricity production sector.

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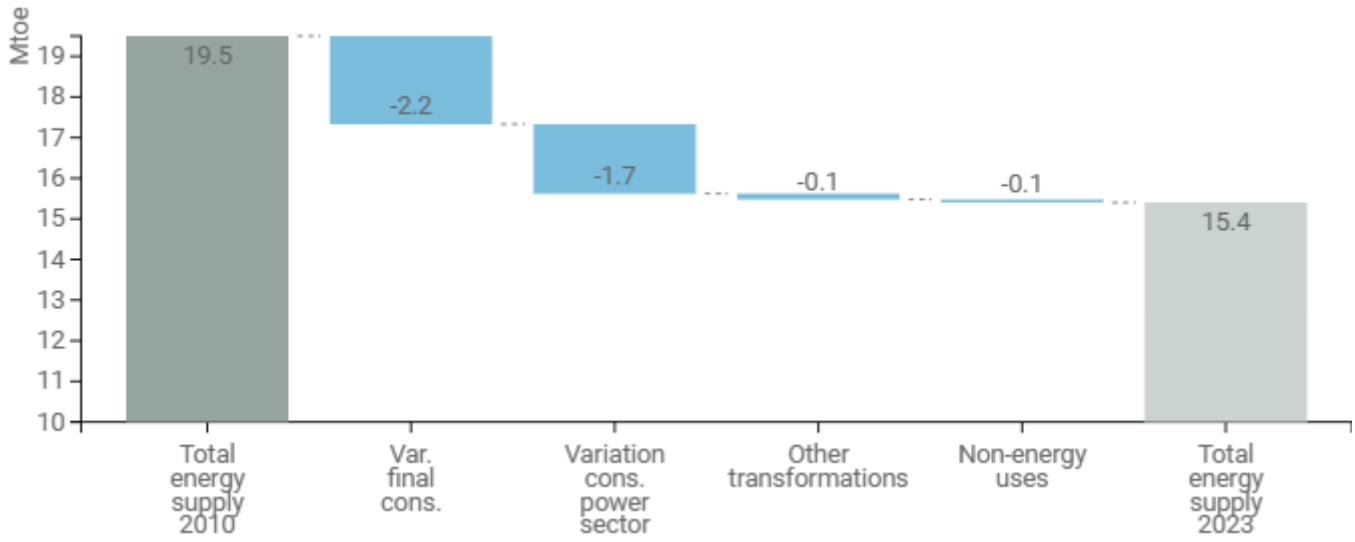
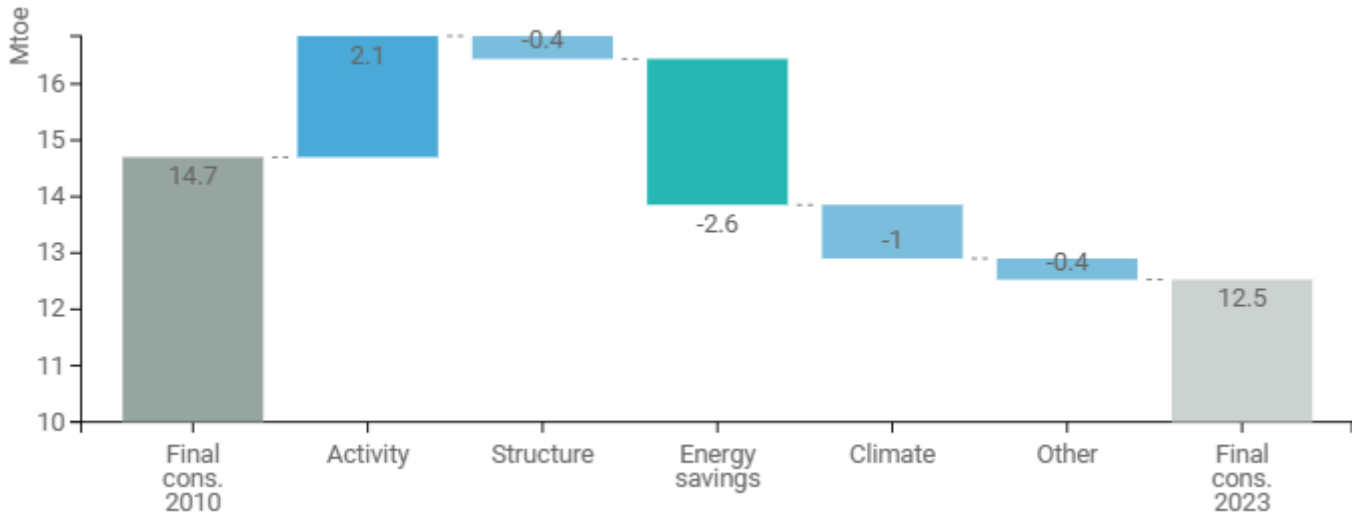
*Figure 4: Main drivers of the total energy supply variation*




Source: Odyssee

The main driver of the final energy consumption decreased from 2010 to 2023 are energy savings followed by climate . On the other hand, an increased in economic activity during this period led to more energy consumption.

*Figure 5: Main drivers of the final energy consumption variation*




Source: Odyssee

The Danish government has a clear ambition: Denmark is to be climate neutral by 2045. A key element in fulfilling this target is energy efficiency along with an increased use of renewable energy.

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*Table 1: Sample of cross-cutting measures*

| Measures | NECP measures | Description | Expected savings, impact evaluation |
|---|---|---|---|
| Establishment of a green fund | No | Through a number of major climate agreements, the government, in cooperation with a broad majority in the Norwegian Parliament, has decided on a number of major investments in Denmark's green transition. These investments contribute to Denmark becoming greener year after year and moving closer to the realization of the climate goals at the same time that Denmark is a green pioneering country. On this basis, the government and the parties to the agreement agree to continue to strengthen the work with the green transition and that further investments are necessary. [Danish title: Etablering af grøn fond] | 0.55 TJ |
| Climate agreement on green electricity and heat 2022 - A greener and safer Denmark | No | With the Agreement on Climate Agreement on Green Electricity and Heat 2022, Denmark have agreed to ensure framework conditions that can enable a fourfold increase in total electricity production from solar energy and onshore wind by 2030. The parties have furthermore agreed to enable tenders for at least 4 gigawatts (GW) of offshore wind to be realized no later than 2030, on the condition that the offshore wind does not negatively impact the state's finances over the project period. Denmark currently produces 2.3 GW of green electricity from offshore wind. It is expected that electricity from the wind farms can, among other things, be used by PtX facilities in Denmark, thereby potentially contributing to the green transition of our aircraft and heavy transport, etc. Political agreements have been made on offshore wind farms that will ensure a further slightly more than 16 GW, including two energy islands. This corresponds to the electricity consumption of more than 23 million households in Europe. There is also described initiatives directly related to energy efficiency. See "General description". [Danish title: Klimaaftale om grøn strøm og varme 2022 - Et grønnere og sikrere Danmark - Danmark kan mere II] | 2.73 TJ |
| Danish Energy Agreement 2018 | No | The government, together with all parliamentary parties, entered into a new energy agreement on 29 June 2018. With the agreement, the electricity consumption can be covered by | 2.73 TJ |

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| | | | |
|---|---|---|---|
| | | renewable energy in 2030. At the same time, the agreement's financing of renewable energy sources shows the way to reach a share of renewable energy of approx. 55 pct. in 2030. Denmark have allocated funding that paves the way for reaching this 55% share of renewable energy by 2030. With the agreement, Denmark will achieve a renewable energy share in electricity consumption exceeding 100%, and at least 90% of district heating will be based on sources other than coal, oil, and gas by 2030. Denmark support the EU's strengthened 2030 energy-efficiency target of 32.5% and will maintain Denmark's proactive role in promoting higher efficiency standards. To address criticism of the current scheme, Denmark will modernize its energy-efficiency efforts by introducing competitive, targeted measures that focus on areas where savings provide the greatest benefit and where costs can be balanced against the cost of expanding renewable energy capacity. | |

Source: MURE

## Buildings

The final energy consumption in buildings, including climatic corrections, increased from 2000 to 2010 and has decreased since then. Two thirds of the energy consumption in buildings are dwellings and the other third are service buidlings. Final energy consumption in dwellings has decreased most.

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




Source: Odyssee

From 2000 to 2023 the energy consumption of households has decreased. The biggest change was in the energy consumption used for space heating, while consumption used for water heating, cooking and electrical appliances was more or less the same.

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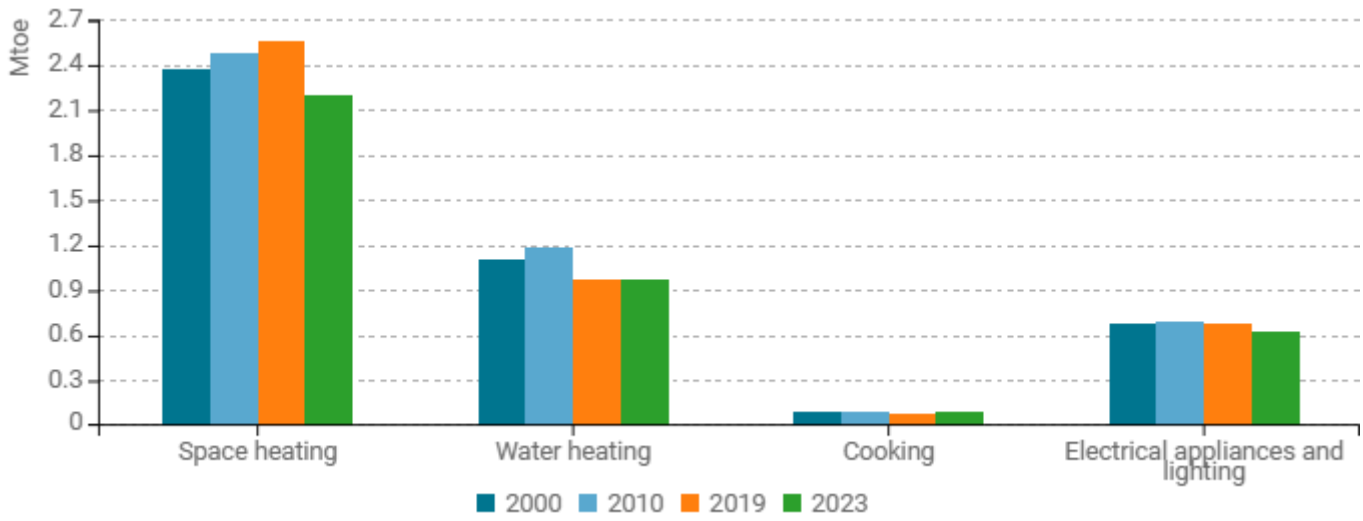
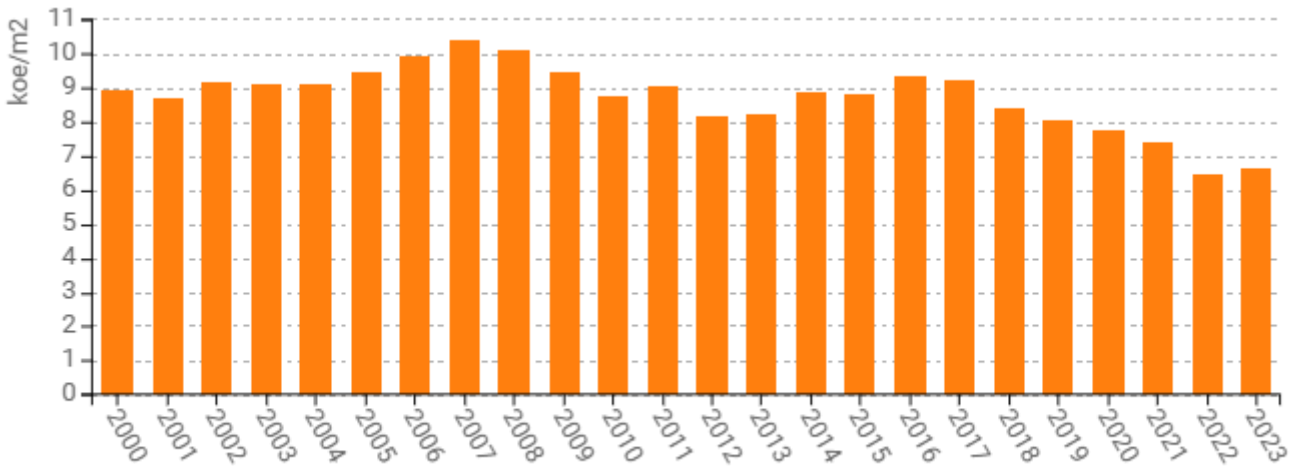
*Figure 7: Energy consumption by end-use of households (with climatic corrections)*




Source: Odyssee

The energy consumption for households' space heating per m2, including climatic corrections, has decreased by an average of 2.5% per year over 2000-2022 from 9 to 6.5 koe/m2, a total decrease of 28%. In 2023 there is an increase in consumption compared to 2022, where energy consumption was influenced by the high energy prices.

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




Source: ODYSSEE

Energy consumption per dwelling has decreased by 2.1% over the period 2000-2023. Energy consumption for households per dwelling, other than space heating, has also decreased, especially for water heating, followed by electrical appliances and lighting.

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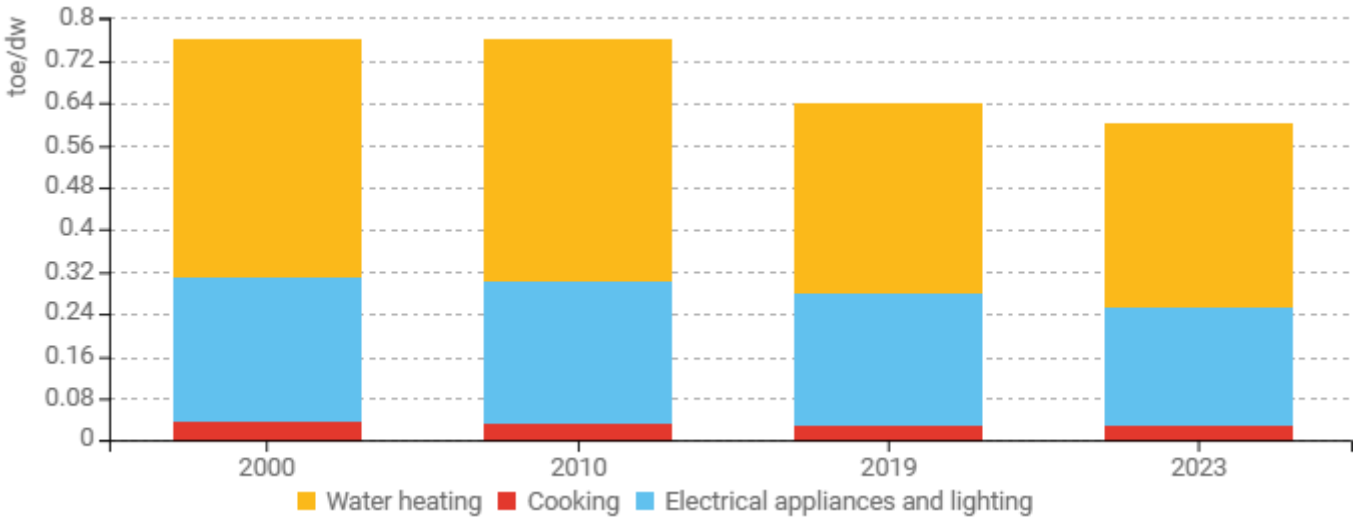
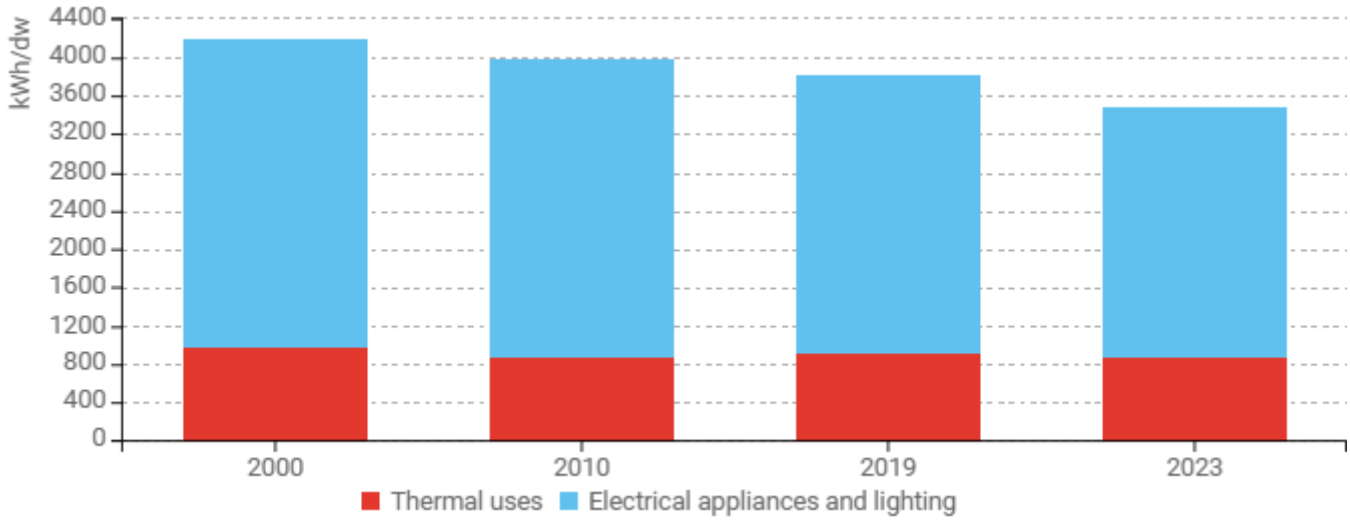
*Figure 9: Energy consumption per dwelling by end-use (except space heating)*




Source: ODYSSEE

Electricity consumption per dwelling has also decreased in this period. The decreased is not so much for thermal uses, as use of heat pumps has increased in this period, but for electrical appliances.

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




Source: Odyssee

The main drivers of the reduction in energy consumption variation in households from 2010 to 2023 are energy savings followed by climate correction. However, more dwellings and bigger dwellings in this period have contributed to an increase in the energy consumption.

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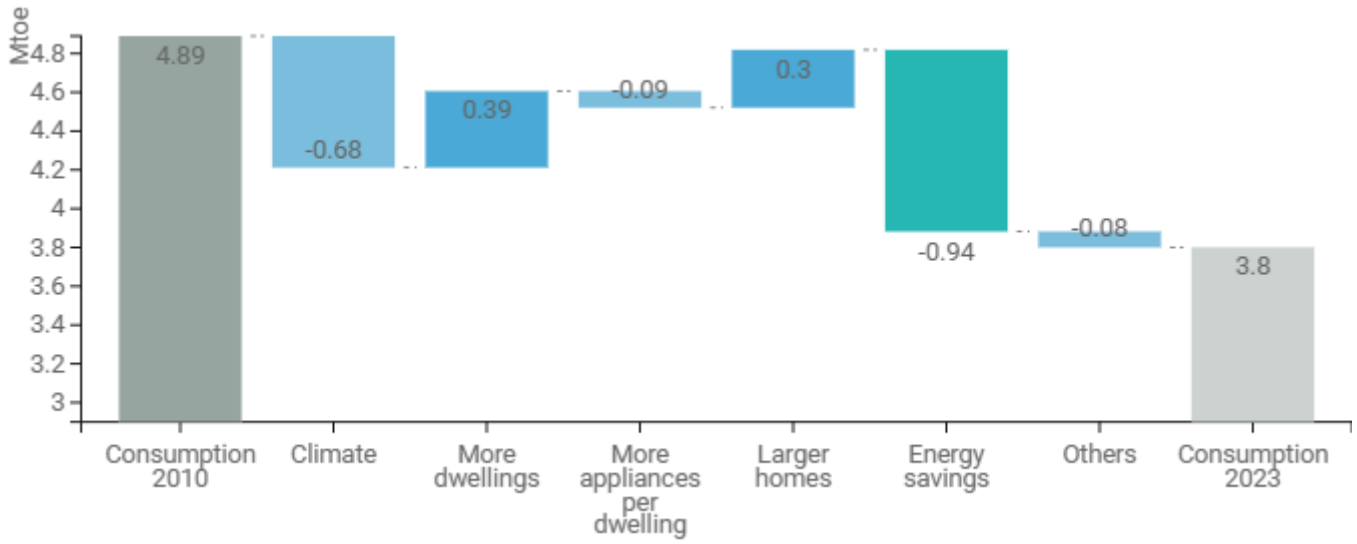
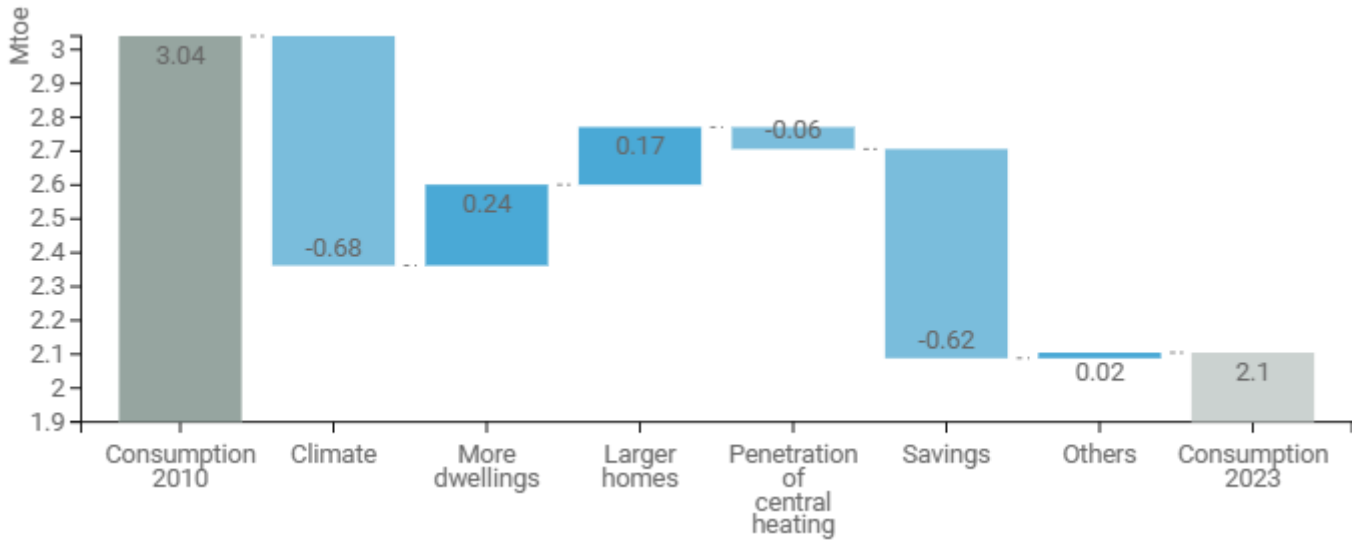
*Figure 11: Main drivers of the energy consumption variation in households*




Source: ODYSSEE

Parallel to variation in energy consumption, the energy consumption for space heating decreased from 2010 to 2023 due to climate variation and energy savings.

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




Source: Odyssee

The energy consumption in services increased from 2000 to 2010 and has decreased since then. The distribution by branches has not changed much through the years. The biggest reduction finds in "wholesale" while energy consumption in "other services" has increased.

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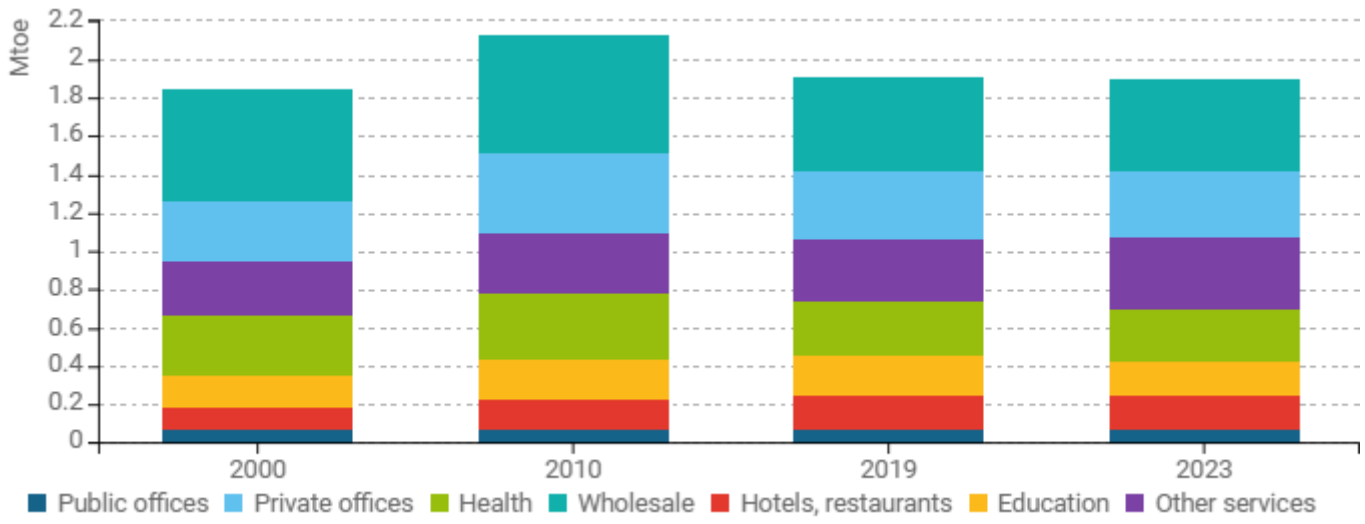
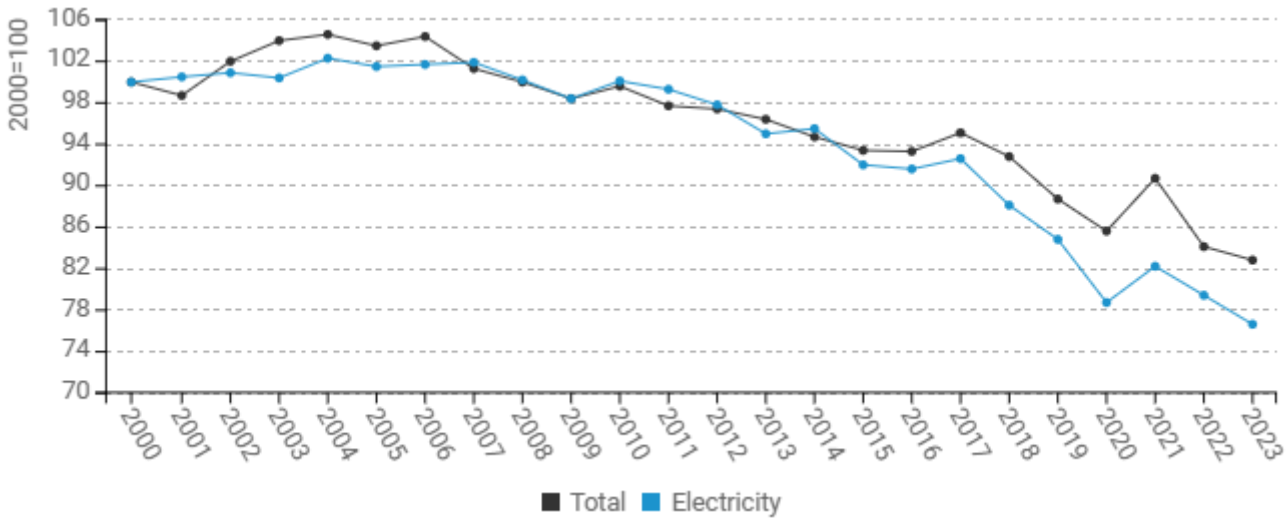
*Figure 13: Final energy consumption of services by branch*




Source: Odyssee

Energy and electricty consumption per employee in the service sector has decreased significantly from 2000. After the low energy consumption in 2020 due to the COVID19-crisis, the energy and electricity consumption increased in 2021, but it has decreased since.

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




Source: ODYSSEE

The policies and measures to promote energy efficiency in buildings are a combination of economic incentives (Making it easier for homeowners to renovate their homes, implementation of scheme to replace oil boilers with heat pumps in areas without access to district heating or access to gas grid), and regulation (as energy requirements for new buildings, Danish certification system of energy performances of buildings, and requirements and labelling

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of energy-related products). Furthermore, a part of rent in social housing goes into a fund that finances refurbishment in the buildings.

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

| Measures | NECP measures | Description | Expected savings, impact evaluation |
|---|---|---|---|
| Subsidy scheme to replace oil burners with heat pumps in buildings outside the district heating and gas grids | Yes | The scheme is implemented as a subsidy scheme with the objective to replace oil boilers with heat pumps in buildings located in areas without access to district heating or the gas grid. | 0.56 TJ |
| Agreement on green refurbishment of social housing | No | A broad political majority has agreed to allocate 30.2 billion DKK for the green renovation of public housing up to 2026. The agreement also introduces a new green guarantee, creating an additional 6 billion DKK incentive for energy renovations in the public housing sector. The goal is to ensure healthy, modern public housing that benefits tenants, supports the green transition, and contributes to the recovery of the Danish economy. Part of the rent payed by tenants in social housing goes to a fund that finances refurbishment of the buildings. There is allocated 30.000.000.000 DKK during 2021-2026. | 0.56 TJ |
| EU-related: Energy Performance of Buildings EPBD - Building regulations | Yes | In October 2020, the Commission presented its Renovation wave strategy, as part of the European Green Deal. It contains an action plan with concrete regulatory, financing and enabling measures to boost building renovation. Its objective is to at least double the annual energy renovation rate of buildings by 2030 and to foster deep renovation. A revision of the Energy Performance of Buildings Directive is one of its key initiatives. A revision of the Energy Performance of Buildings Directive is one of its key initiatives. | 0.94 TJ |

Source: MURE

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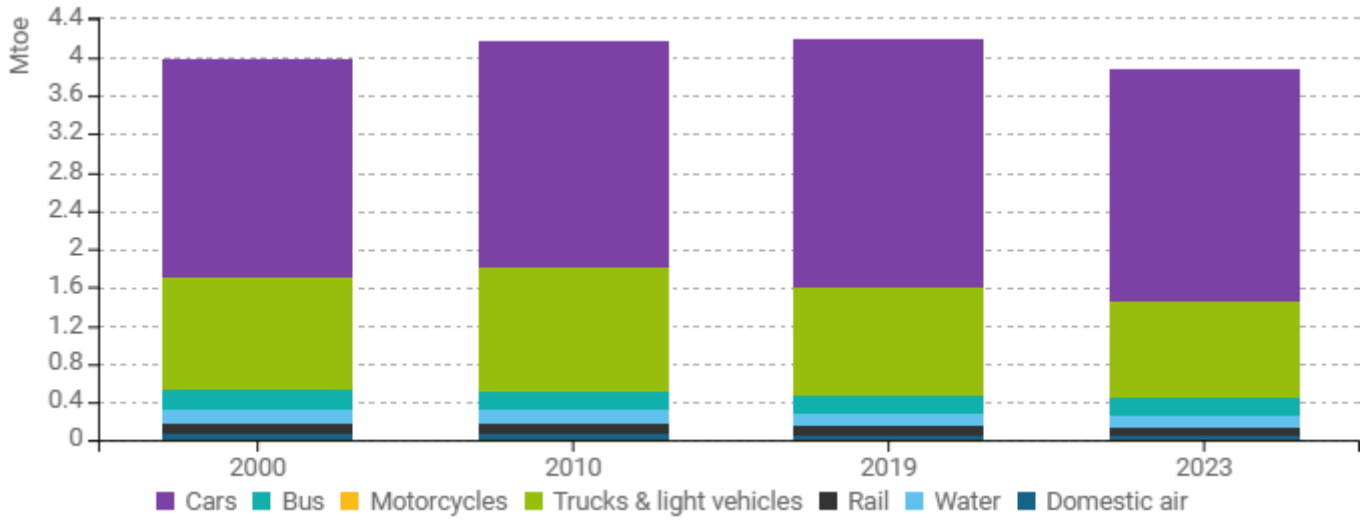
## Transport

Energy consumption in transport has decreased 1.7% between 2022 and 2023. Energy consumption of truck and light vehicles has decreased by 6.8%. Inland waterways transport 3.8%, and bus and railway around 2%. Their energy consumption of cars has increased 0.7% between 2022 and 2023.

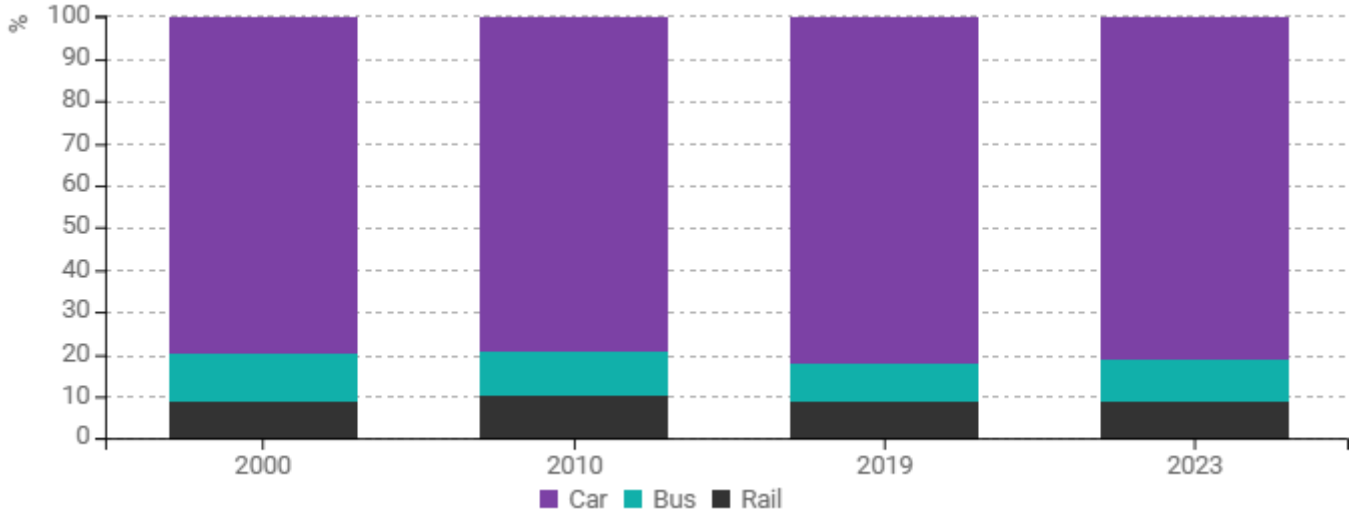
*Figure 15: Transport energy consumption by mode*




Source: ODYSSEE

Passenger traffic by carrepresents 81.2% of the traffic of passengers in 2023 compared to 80% in 2000. Transport of passenger by bus decreased from 12% in 2000 to 10.2% in 2023 while transport of passengers by rail stays stable at 9% of the total passenger traffic.

*Figure 16: Modal split of inland passenger traffic*




Source: ODYSSEE

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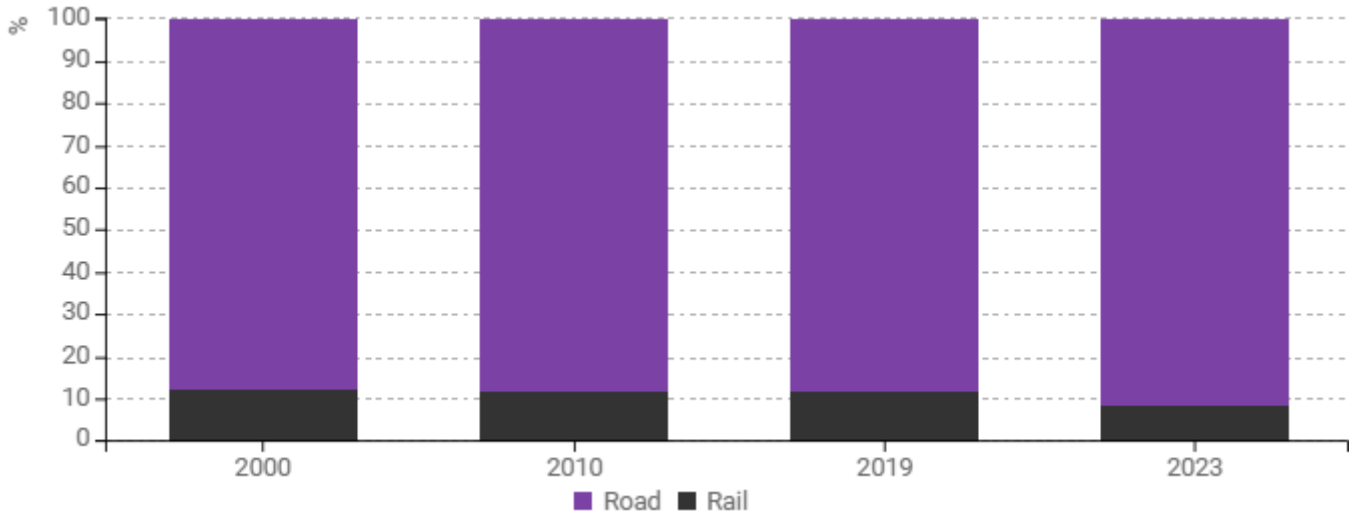
The share of inland freight traffic shows how energy consumption of road transport is more and more significant over time.

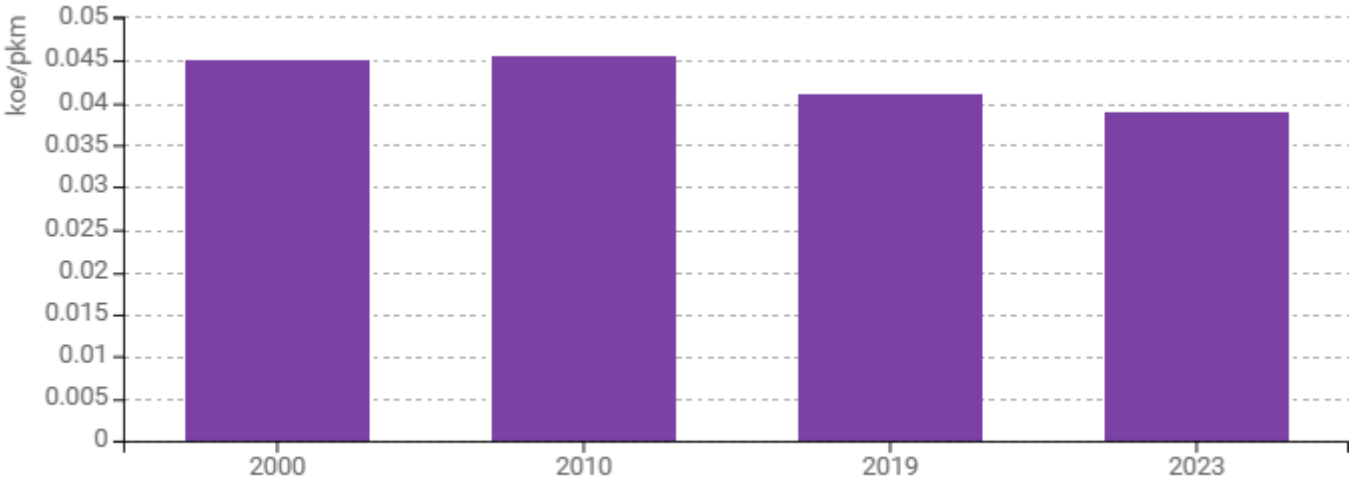
*Figure 17: Modal split of inland freight traffic*




Source: ODYSSEE

When looking at energy consumption of cars per passenger-km there is an annual decrease in energy consumption of 0.6% from 2000. From 2022 to 2023 the decrease has been 1.2% even though the total energy consumption of cars has increased in 2023.

*Figure 18: Energy consumption of cars per passenger-km*




Source: ODYSSEE

The energy consumption in the transport sector has decreased from 2000 to 2023 due to energy savings and although there was an increase in activity.

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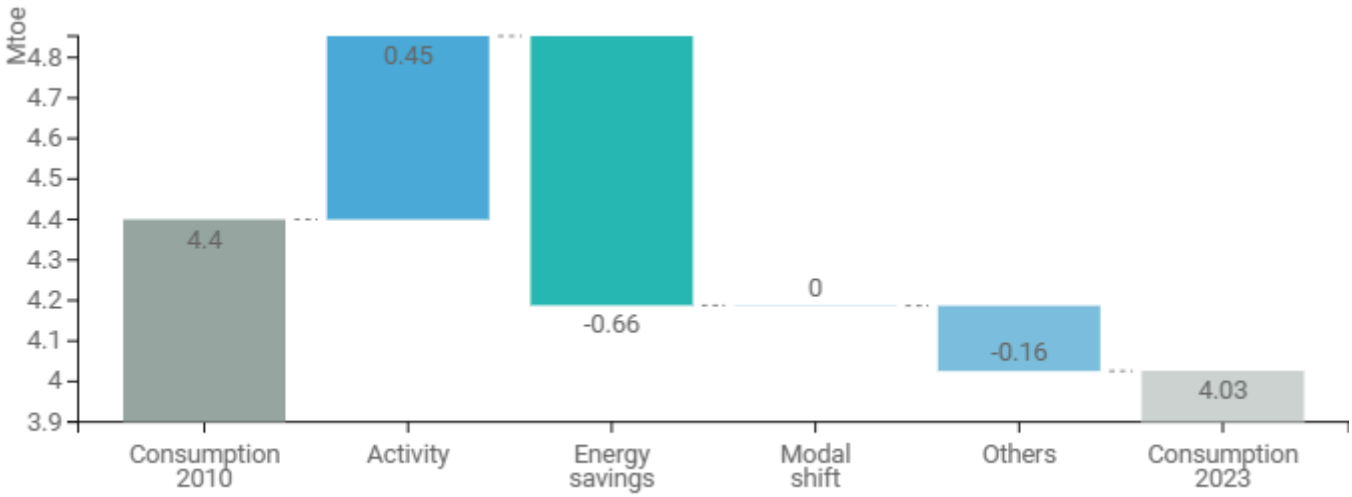
*Figure 19: Main drivers of the energy consumption variation in transport*




Source: ODYSSEE

The policies and measures to promote energy efficiency in the transport sector are a combination of economic incentives (kilometer-based road tax for trucks, tax on gasoline, green owner fee, taxes on registration of new cars), and regulations (Energy and emission regulations for taxis, limos and healthcare transportations, green procurement of vehicles).

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

| Measures | NECP measures | Description | Expected savings, impact evaluation |
|---|---|---|---|
| Reorganization of registration tax for cars | No | The agreement includes the reorganization of the taxation scheme for cars so that users have a greater incentive to choose electric cars over conventional fossil fuel technology.: Ambition for 1 million green cars by 2030. Work towards a stop to sales of new fossil-fuel cars no later than 2030. Reform of the registration tax for passenger cars and vans. | 0.72 TJ |
| Kilometer-based road tax for trucks | No | In the new kilometer-based road tax system, trucks pay according to how much CO2 is emitted from driving. Green trucks therefore pay less in road tax than equivalent conventional trucks. The change will take place from 2025, so truckers and others will be given the opportunity to adjust beforehand. The overall agreement is estimated to reduce CO2 emissions by approx. 0.2 million tonnes | 0.17 TJ |

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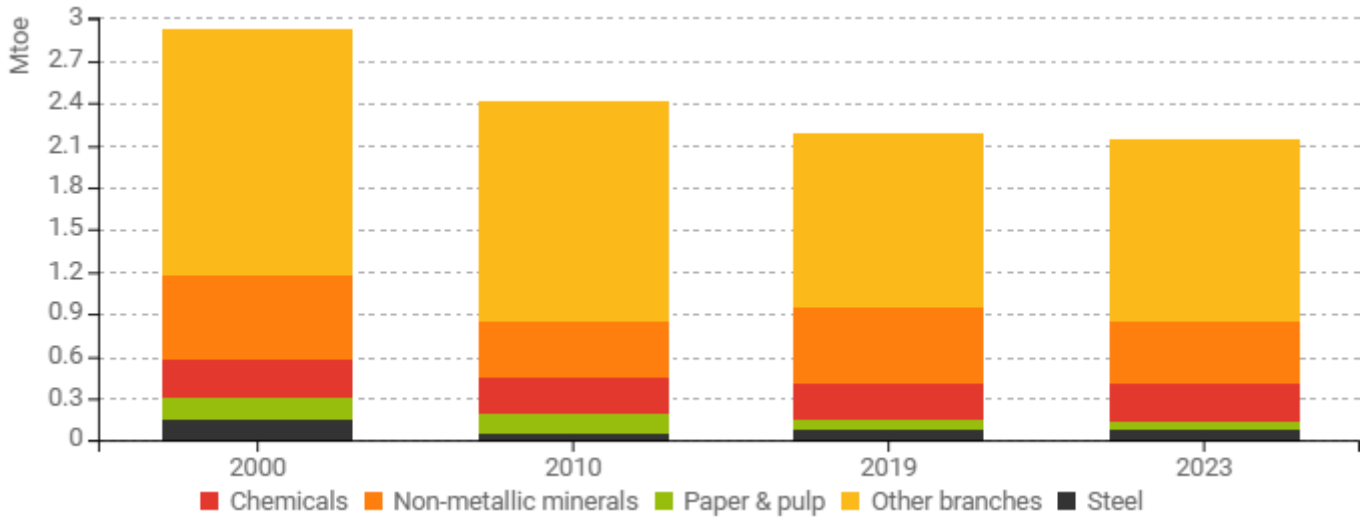
|---|---|---|---|
| | | in 2025 and approx. 0.3 million tonnes in 2030. [Danish title: Kilometerbaseret vejafgift for lastbiler] | |

Source: MURE

## Industry

Energy consumption in industry has decreased significantly since 2000 and was lowest in 2015-2016. Energy consumption increased again until 2021 and has decreased the last two years. From 2000 to 2023 there is an annual decrease of 1.3% or 26.5% in total.

*Figure 20: Final energy consumption of industry by branch*




Source: ODYSSEE

The energy intensity of industry has decreased 3.7%/year from 2000 to 2023. When focusing on the manufacturing sector only, the decrease has been 6.7%/year.

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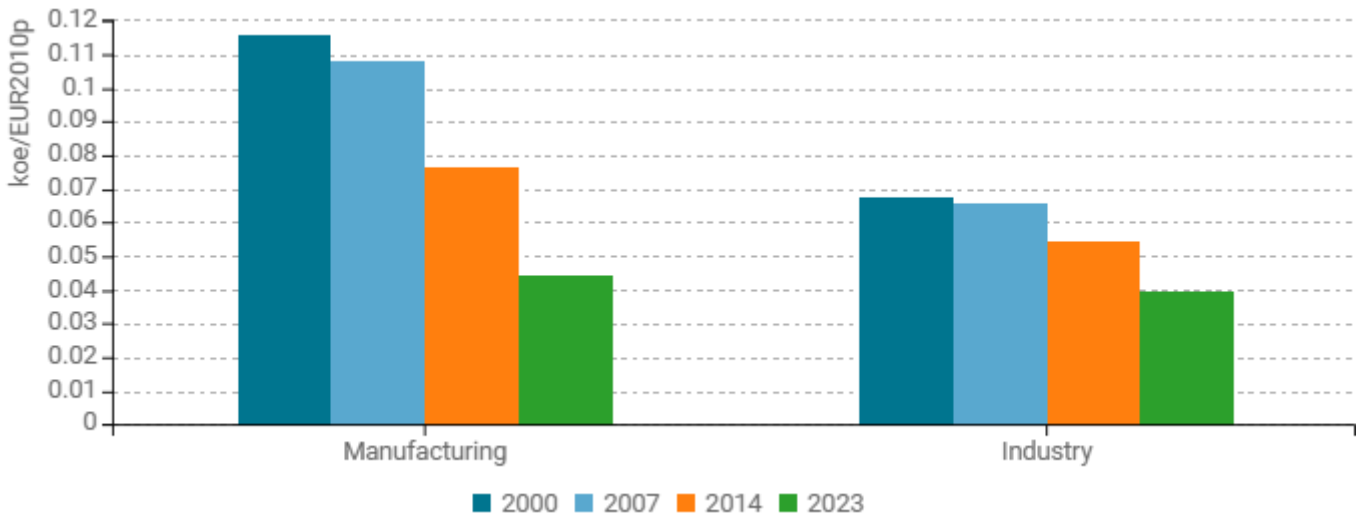
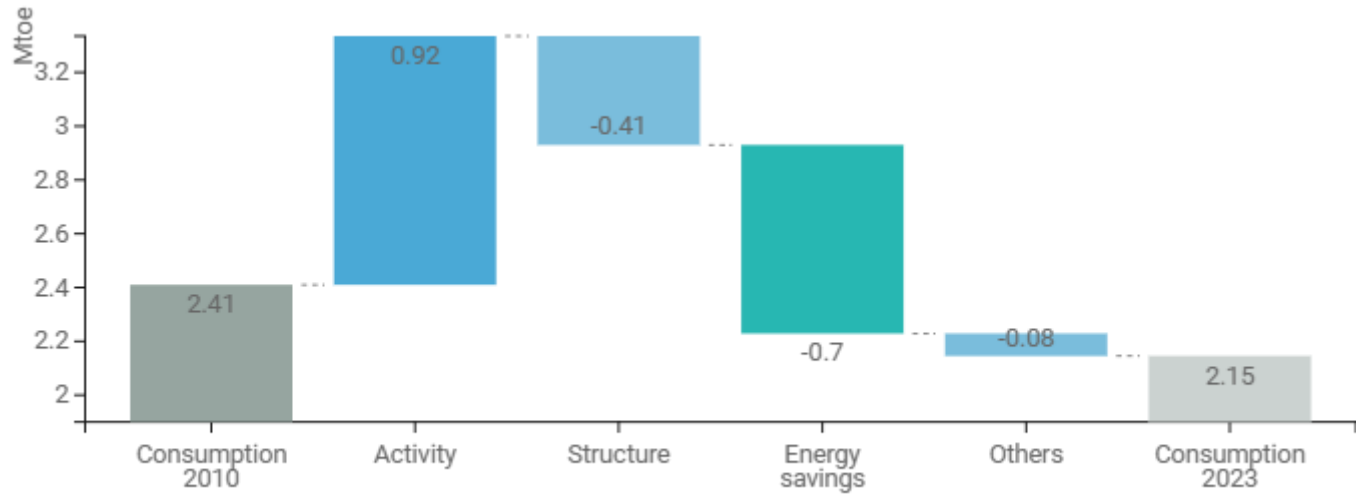
*Figure 21: Energy intensity of industry (at purchasing power parities)*




Source: ODYSSEE

The decreasing energy consumption in industry is mainly due to energy savings and to a lesser extent to change of structure. In the opposite direction an increase in activity has led to more energy consumption.

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




Source: ODYSSEE

The policies and measures to promote energy efficiency within the industrial sector are a combination of economic incentives (schemes aimed at achieving energy savings in businesses) and regulation (certification of energy efficiency in buildings, energy labelling and eco-design).

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

| Measures | NECP measures | Description | Expected savings, impact evaluation |
|---|---|---|---|
| Competitive subsidy scheme related to private enterprises | Yes | The scheme is aimed at achieving energy savings in businesses and is open to end user energy savings projects as regards all types of energy in most of the private sectors in Denmark and most types of activities in Denmark. Road transportation, shipping, and savings in the IT sector are exempt. | 2.06 TJ |
| Increase in energy tax rates on business as part of Green Tax Reform, phase 1 | No | Increase in energy taxation on business energy consumption for process purposes. The parties in the agreement agree that a uniform $CO_2$ tax is part of the solution, but companies must have the opportunity to invest in green solutions and energy efficiency measures first. (Grøn skattereform #1 - på vej mod et grønner danmark) | 0.40 TJ |
| Mandatory energy audit in large enterprises | Yes | The EU's Energy Efficiency Directive (EED) from 2023 requires companies with an annual energy consumption above 10 TJ to implement energy management or carry out an energy audit every four years. It is the company's total national energy consumption that determines whether it is subject to the requirements for energy management, energy audits, and climate audits. If the company is part of a group, the group's total national energy consumption must be included in the calculation, and any subsequent exemptions for certain parts of the group's energy consumption are not deducted from the calculation. | 0.11 TJ |

Source: MURE

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