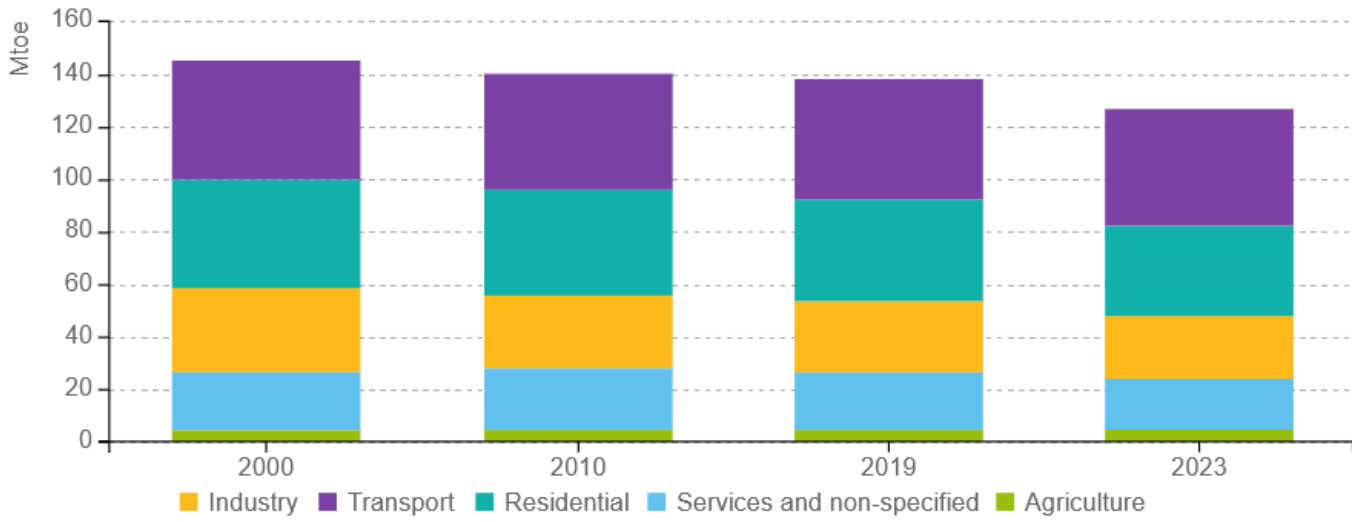
Energy efficiency trends and policies

Overview

In 2023, France's final energy consumption stood at 127 Mtoe—9% lower than in 2010—despite a 30% rise in GDP. The transport sector remained the largest energy consumer in 2023 (35% of the total), with consumption slightly increasing by 0.1%/year between 2010 and 2023, though it actually decreased by nearly 1%/year between 2019 and 2023. Meanwhile, residential energy use fell by 1%/year over the same period. In the short term, the final energy consumption of the industrial sector and of services decreased by more than 3%/year between 2019 and 2023. In contrast, agriculture's energy use stays stable over time and accounts for 4% of final energy consumption in 2023.

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



Source: ODYSSEE

Energy efficiency, as measured by ODEX (an indicator which aggregates energy efficiency progress for all sectors and end-uses), improved by an average of 1.3%/year between 2000 and 2023. The residential sector achieved the largest gains (2.2%/year), improving its efficiency by 25% on the same period. The service and transport sectors are 15 and 12% more efficient in 2023 than in 2010, respectively. After seeing massive improvements in the early 2000s, energy efficiency gains in the industry stagnated between 2009 and 2015 before improving by 0.8% per year until 2023.

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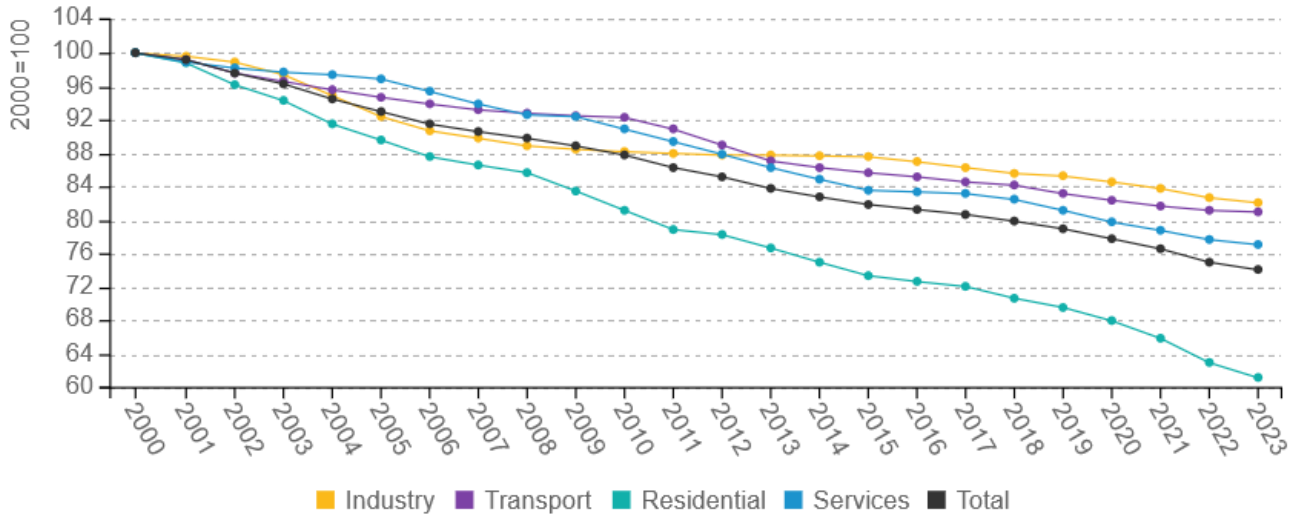
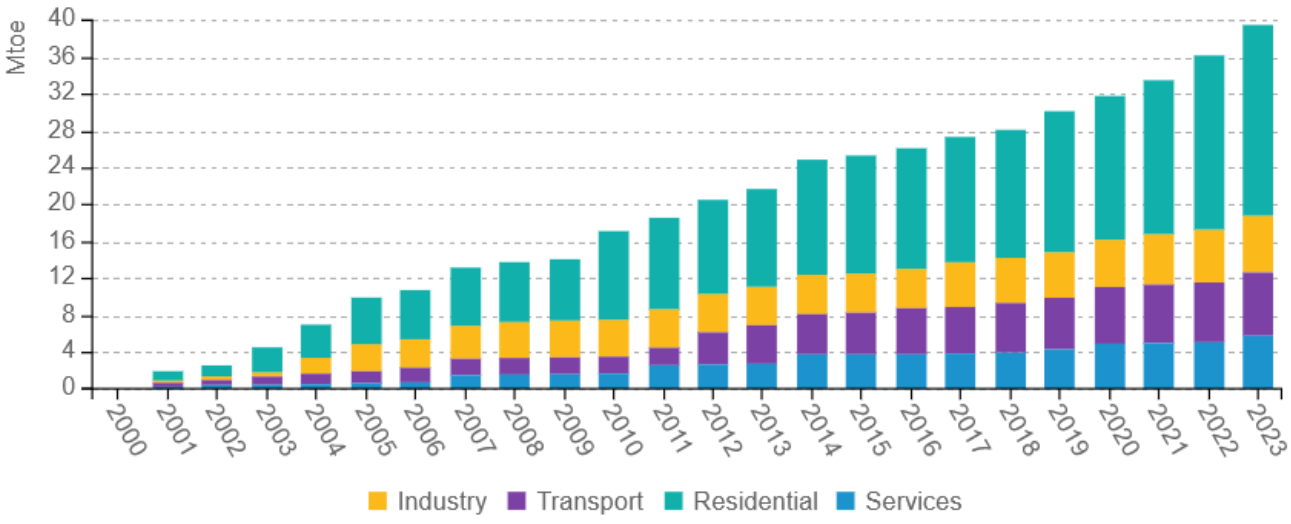
Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Figure 3 shows additional annual energy savings cumulated since 2000. Without the energy efficiency improvements shown in Figure 2, France's 2023 final energy consumption would have been 40 Mtoe higher, representing almost a 30% increase. As the largest gains were achieved in the residential sector, it follows that it accounts for the majority of savings. Although, the transport sector makes up the largest share (35%) of final energy consumption, it is only 17% of cumulated energy savings in 2023.

Figure 3: Energy savings by sector



Source: Odyssee

Total energy supply decreased by 49Mtoe between 2010 and 2023. The decrease in final energy consumption (-21Mtoe) is the main factor driving the energy supply variation. Another important driver is the variation of the energy consumption of the power sector (-20Mtoe) which can mainly be explained by the changes in the power

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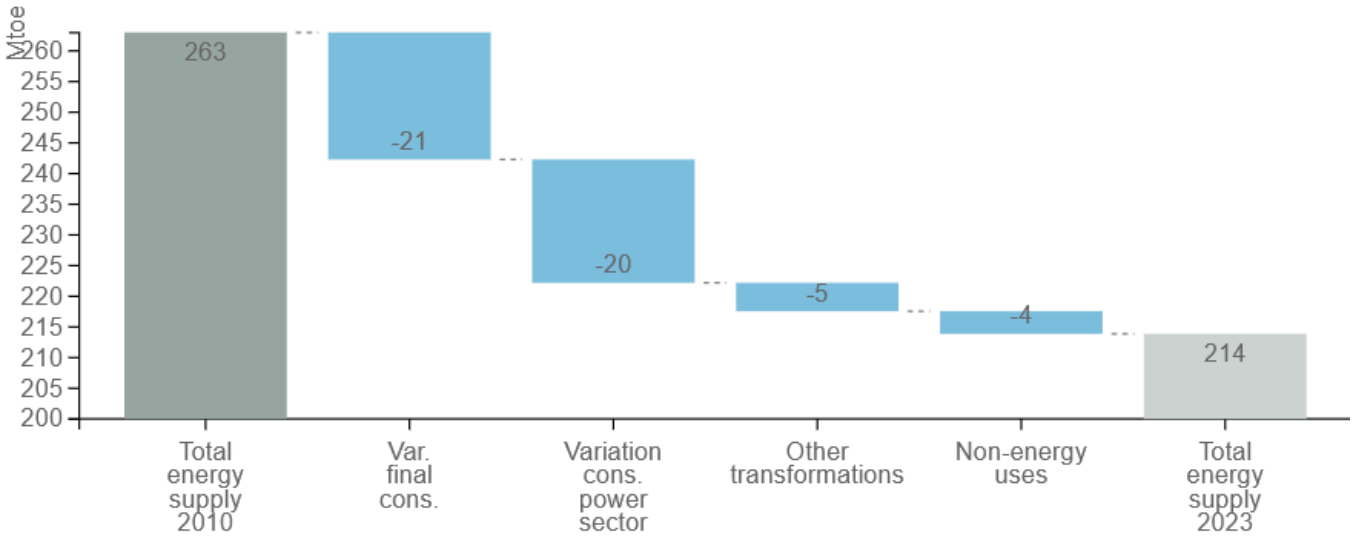
sector energy mix. With renewables having a 100% efficiency rate, as the power sector energy mix becomes greener, it also consumes less energy to produce the same amount of electricity. Energy transformations in other energy sub-sectors have also improved leading to an energy supply decrease (-5Mtoe). Finally, the use of energy fuel as production input as also decreased (-4Mtoe).

Figure 4: Main drivers of the total energy supply variation



Source: Odyssee

Although the level of economic activity has increased between 2010 and 2023, the induced change in final energy consumption (+12Mtoe) is compensated by other factors. The structure of the economy becoming less energy-intensive, with a higher share of the services in the total value-added, leads to lower energy demand (-1Mtoe). The climate being relatively milder in 2023 compared to 2010, less energy is needed for space heating leading to a relative climate effect of -9Mtoe. The largest driver remains technical energy savings (-22Mtoe) derived from the technical energy efficiency (ODEX). The “other” effect includes behavioural changes, inefficient use of equipment, and changes in labour productivity.

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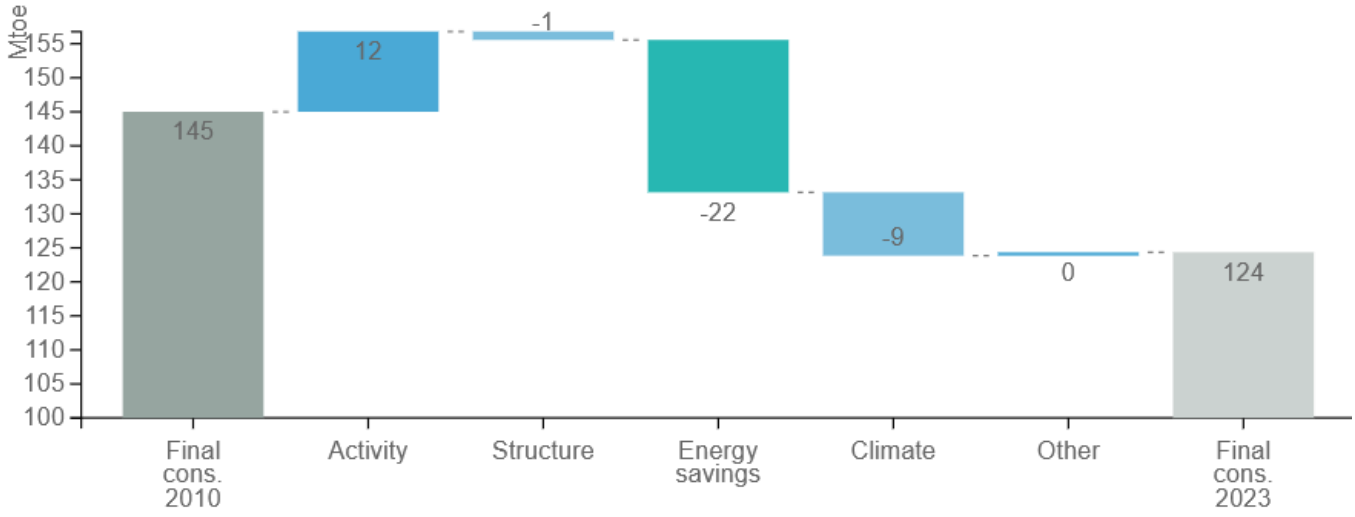
Figure 5: Main drivers of the final energy consumption variation



Source: Odyssee

Energy efficiency is a central principle in the French low-carbon transition. The Energy Transition Act of 2015 introduced a provision aimed to halve final energy consumption between 2012 and 2050. The Multiannual Energy Programming and the National Low-Carbon Strategy are the key planning documents outlining the roadmap for achieving energy efficiency targets both in the short and long term. In 2014, to comply with the Energy Efficiency Directive, France adopted its third National Energy Efficiency Action Plan (NEEAP) setting a final consumption target of 131 Mtoe in 2020, which was reached with the Covid-19 pandemic being likely responsible for the drop in energy consumption. The 2024 National Energy and Climate Plan, sets a target of 30% reduction in final energy consumption in 2030 compared to 2012, to reach 107 Mtoe of final energy consumption in 2030 or a 21% lower than 2022 level. The two main cross-cutting measures enabling France to reach its energy savings target are: i) the Heat Fund, and ii) the Energy Saving Certificates scheme, setting a 3100 TWhc savings target for the 5th period (2022-2025), 45% higher than the 4th period's target. In addition, the French government realised 2 energy sufficiency plans in 2022 and 2023.

Table 1: Sample of cross-cutting measures

Measures	NECP measures	Description	Expected savings, impact evaluation
Energy Saving Certificates (ESC)	Yes	The ESC scheme requires energy retailers and fuel suppliers to achieve specific energy savings. Obligated parties fulfil these targets by encouraging their customers, primarily in the building sector, to reduce energy consumption. On top of energy saving actions, the certificates can also be delivered for the deployment of energy efficiency programmes. It is the only measure reported to	830.5 PJ

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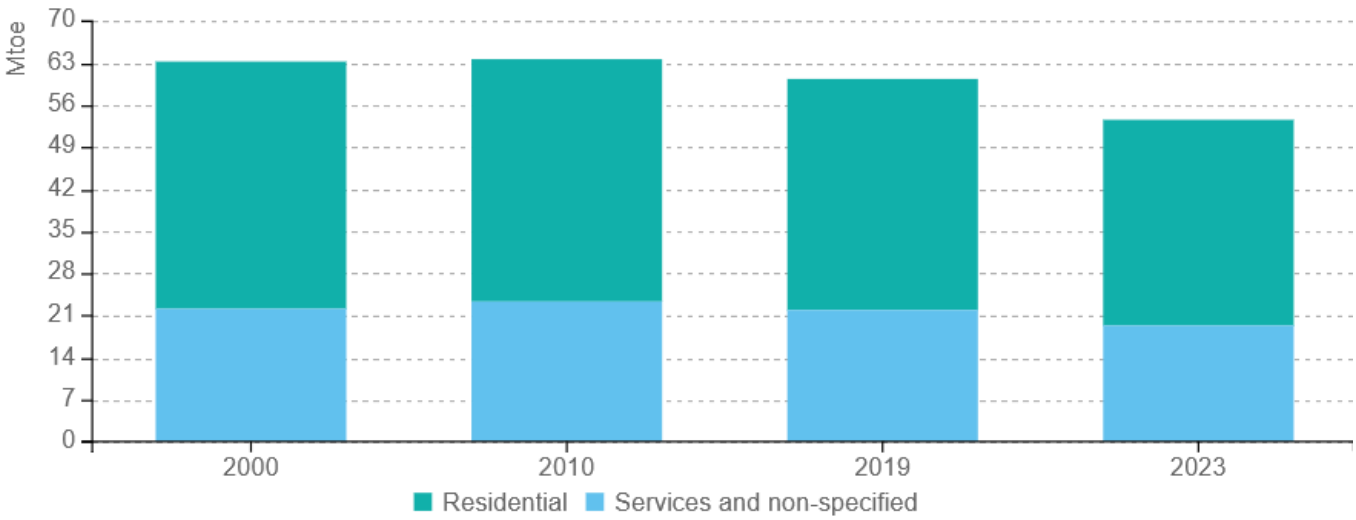
		the EED regarding final energy consumption target under Article 8.	
Heat Fund	Yes	The Heat Fund supports the production of heat from renewable energies, such as the development of the use of biomass (forestry, agricultural, biogas, etc.), geothermal energy (through direct use or by means of heat pumps), solar, thermal energy, recovered energies, as well as the networks linked to these energies.	

Source: MURE

Buildings

Final energy consumption of buildings fell by 16% between 2010 and 2023, reaching 54Mtoe in 2023 -equivalent to 42% of total energy use. Residential buildings use 2/3 of this final energy while accounting for 3/4 of total building area. Energy consumption declined at a rate of -0.6%/year between 2010 and 2019, while the pace increased at -3%/year between 2019 and 2023.

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



Source: Odyssee

Space heating has always been the most important energy end-use for households, at more than 2/3 of final consumption, while water heating and specific electricity represent 10% and 16% of energy consumption, respectively. Although most end-uses have seen their energy use decline overtime, specific electricity has increased on average by 1.2%/year between 2010 and 2023. Air cooling now amounts to 1% of energy consumption.

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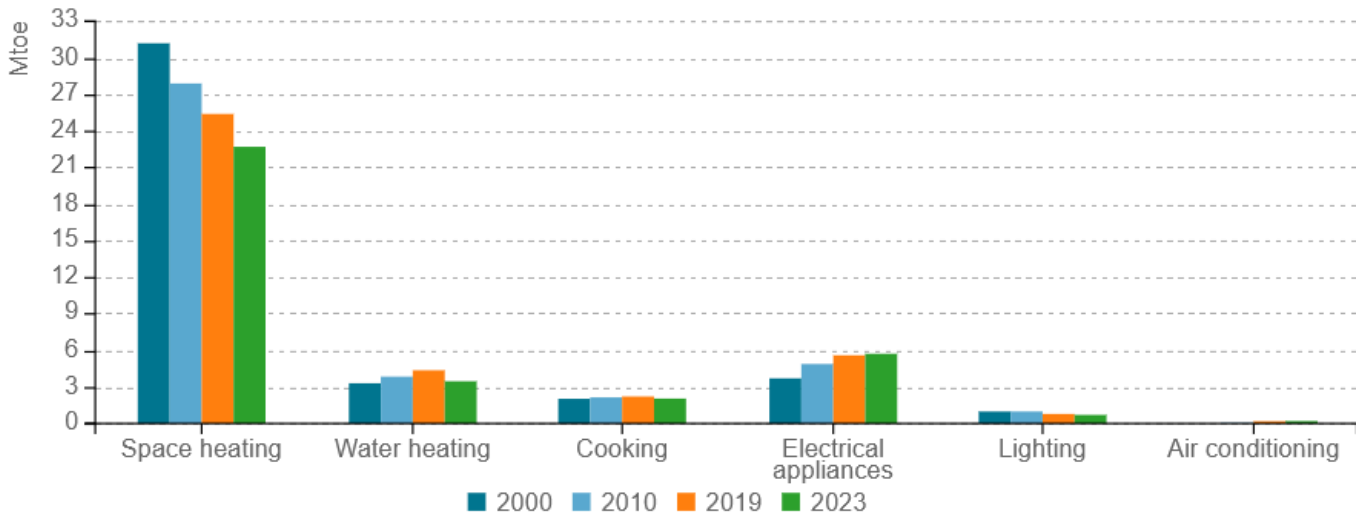
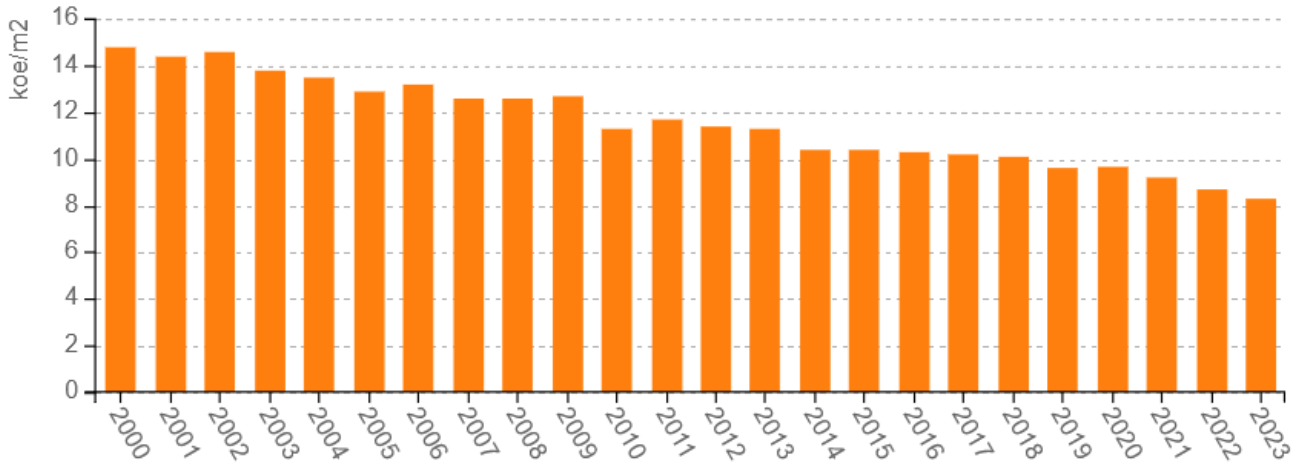
Figure 7: Energy consumption by end-use of households (with climatic corrections)



Source: Odyssee

As residential building area keeps on growing, energy consumption for space heating per m2 declines faster than the overall end-use consumption, at an average rate of -2.5%/year since 2000. Indeed, total space heating energy consumption declined at an average rate of -1.4%/year while total residential building area increased by an average rate of 1%/year since 2000.

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



Source: ODYSSEE

Energy consumption per dwelling declined between 2010 and 2023, when considering all end-uses but space-heating. Electrical appliances make up the bulk (53%) of a dwelling's energy consumption at 0.21toe/dw in 2023. Between 2019 and 2023, most end-uses showed a faster rate of decline in consumption compared to previous

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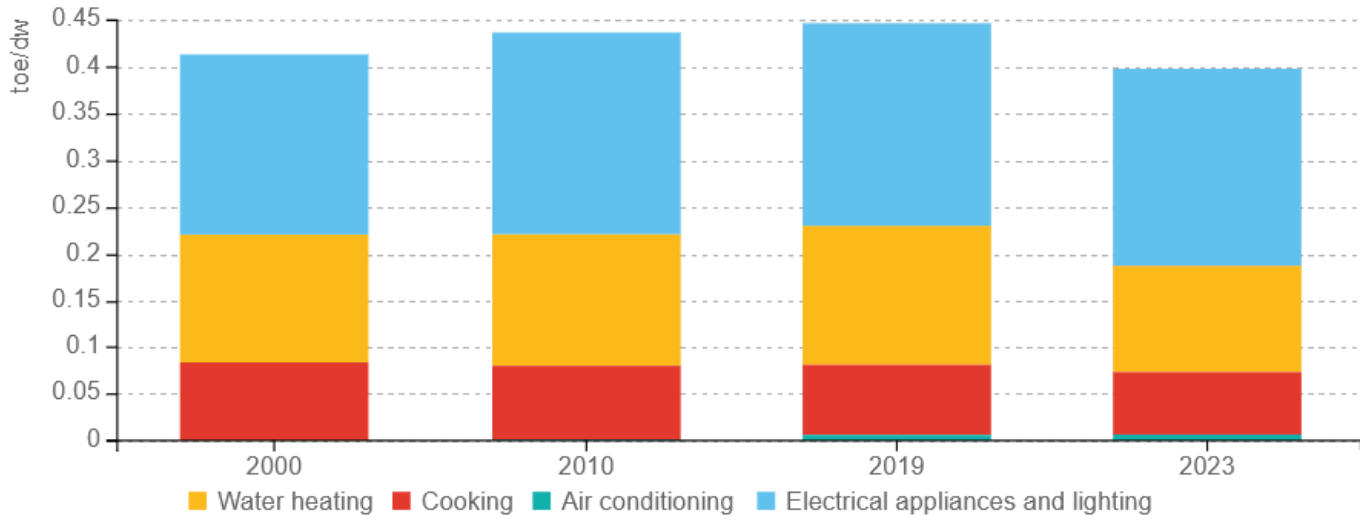
years, with the exception of air cooling. This acceleration was likely driven by the phase-out of older fuel and gas boilers and stoves.

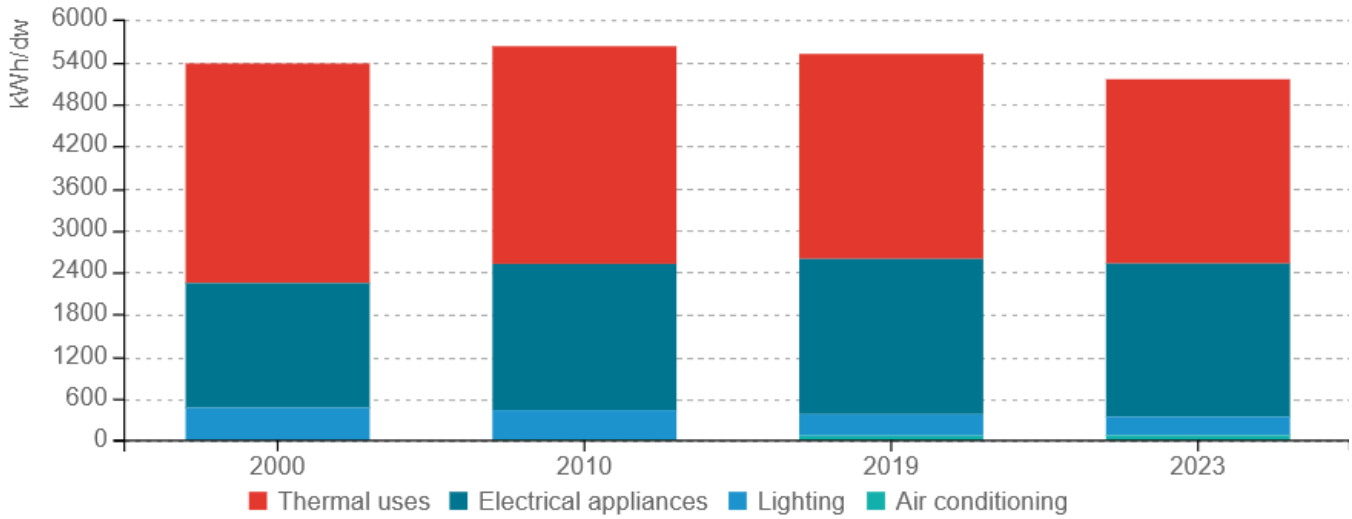
Figure 9: Energy consumption per dwelling by end-use (except space heating)



Source: ODYSSEE

Electricity makes up 36% of the residential sector energy consumption. Consumption per dwelling has declined by on average -0.7%/year since 2010, and amounts to 5.2MWh/dw/year in 2023. Electricity is mostly used for heating (51% of a dwelling electricity consumption) and for electrical appliances (42%). The latter have seen their consumption increased by an average of 0.4%/year/dw since 2010.

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



Source: Odyssee

Final energy consumption of households was 12Mtoe lower in 2023 than in 2010. Two factors are positive drivers of this consumption : the number of dwellings (“more dwellings”)(+4.5Mtoe) and the equipment ownership rate

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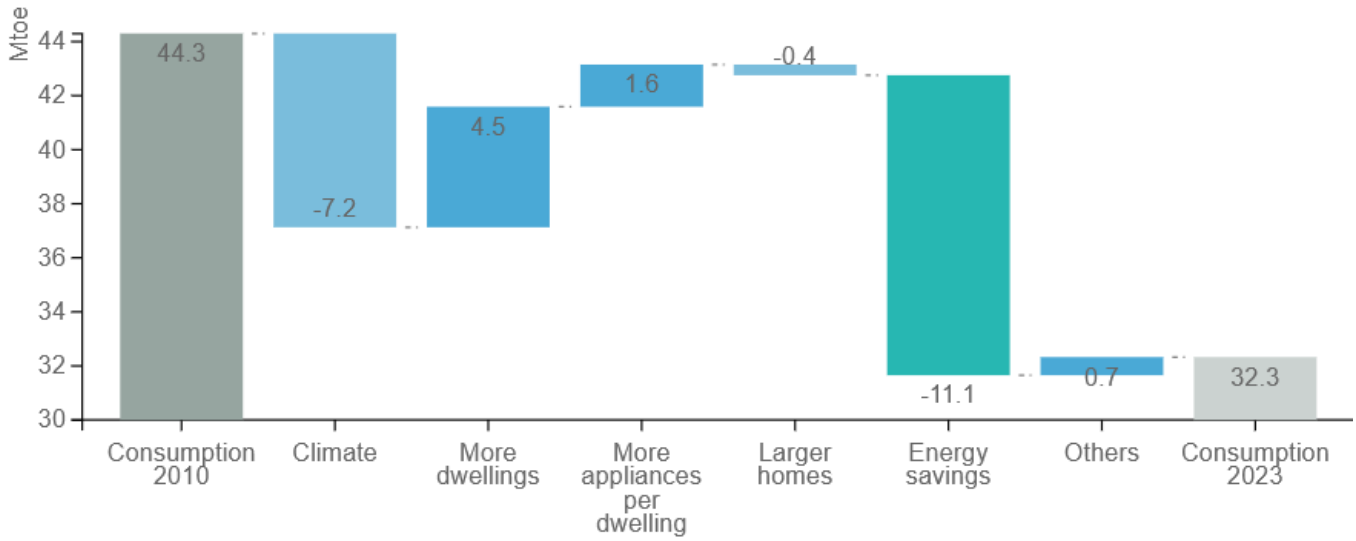
("more appliances per dwelling")(+1.6Mtoe). However, the climate was milder in 2023 leading to a decrease in energy consumption (-7.2Mtoe). Energy savings largely offset the effect of socio-economical and natural drivers and reduced the residential sector's energy consumption by 11.1Mtoe. The average size of new dwellings is lower in 2023 than in 2010 reducing consumption by -0.4Mtoe. The "other" effect can be likened to changes in behaviour.

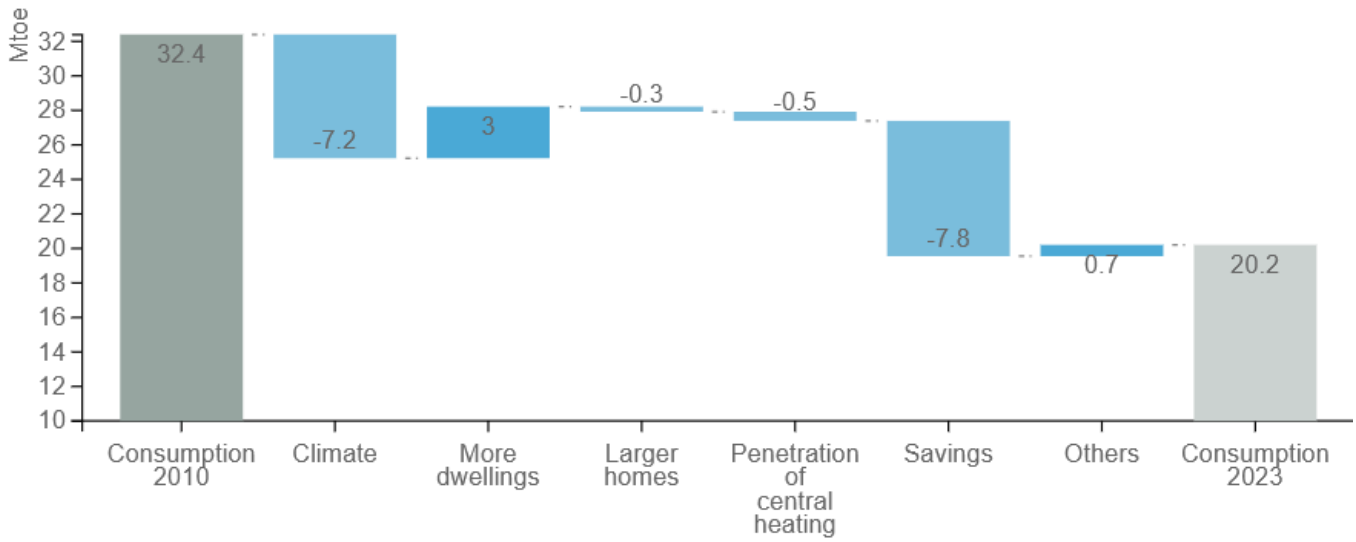
Figure 11: Main drivers of the energy consumption variation in households



Source: ODYSSEE

As space heating accounts for most of the residential sector's final consumption, the drivers of change in Figure 12 are fairly similar to the changes in the overall residential sector. The decrease is correlated to the relatively milder climate (-7.2Mtoe) in 2023 compared to 2010 and the achieved energy savings (-7.8Mtoe). More efficient central heating also contributes to the reduction in consumption (-0.5Mtoe).

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



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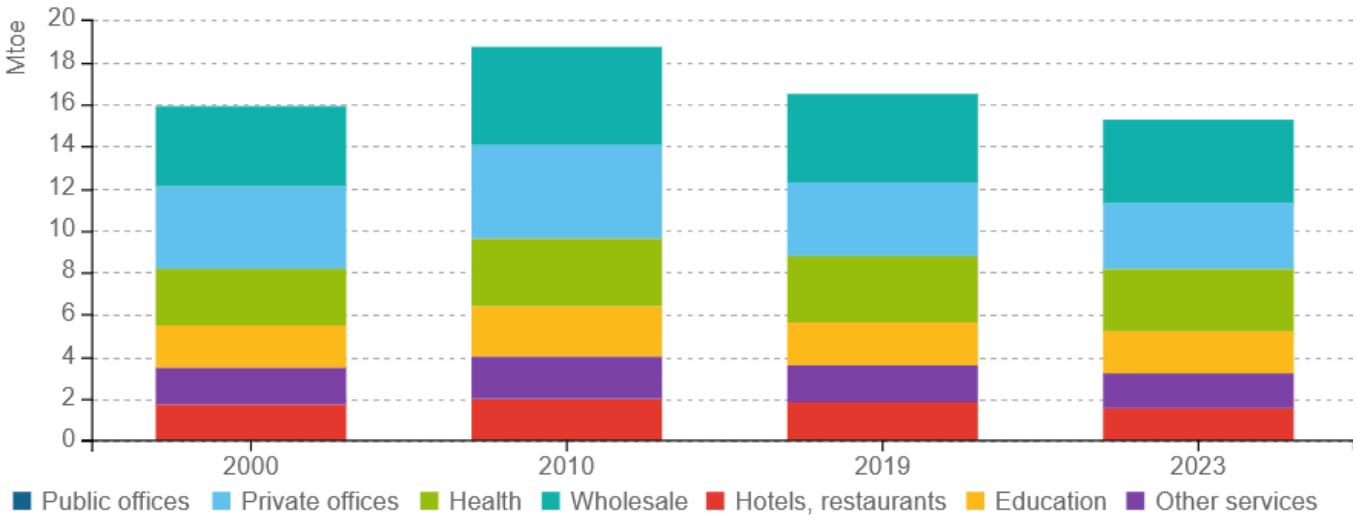
Source: Odyssee

Final energy consumption of services has been increasing by 18% between 2000 and 2010 before declining by 1.6%/year until 2023. Offices account for 1/5 of services final consumption in 2023 and 23% of the total building area. Buildings linked to retail makes up 25% of the final consumption.

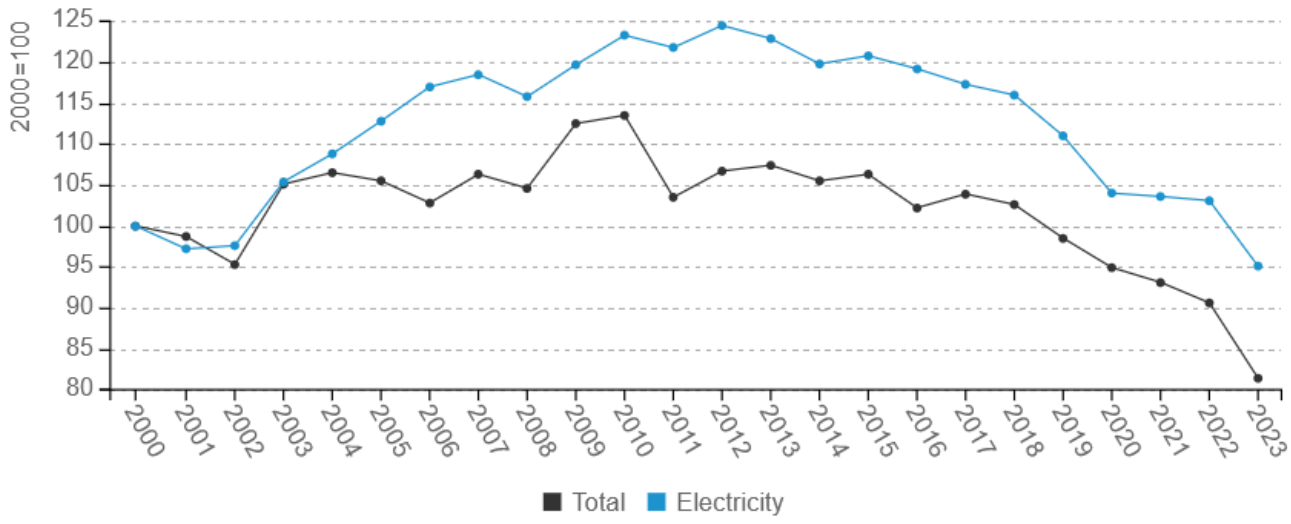
Figure 13: Final energy consumption of services by branch



Source: Odyssee

In the service sector, the total energy consumption per m² has decreased by 0.4%/year since 2000. However, until 2010, electricity consumption was increasing by 2%/year, driven by the widespread adoption of IT and electrical appliances, despite improvements in their efficiency. In the second half of the period, the electricity consumption has been decreasing, returning to its 2000 level.

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



Source: ODYSSEE

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In France, building codes are key measures to improve energy efficiency in buildings. The last update (RE2020) is particularly ambitious with a maximum consumption of 100 kWh/m2 for all end-uses. Still, three quarters of the current building stock was built without building codes. As a result, and despite the great efforts made since year 2000, the average performance of the building stock in terms of energy consumption per m² is one of the worst in Europe. Hence, to bring down energy consumption to a BBC level for the full building stock by 2050 (Ecological Transition Law), the government has set ambitious targets, such as the retrofitting of 500,000 existing dwellings each year. The Energy and Climate Act of 2019 also sets a new target to renovate all the "thermal sieves" within 10 years. To support thermal renovation in the residential sector, around €5.6 billion were invested by the government in "MaPrimeRénov'", a state subsidy scheme. Furthermore, around 68% of the services sector's building stock is now subjected to the Éco Énergie Tertiaire rule, which requires a 60% reduction in final energy consumption by 2050 compared to 2010 levels.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Building code of 2020 (RE 2020)	Yes	Requires all new buildings to produce more energy than it consumes based on the principle of positive energy buildings (PEB), (i.e., new residential buildings are required to have a primary energy consumption lower than a threshold 100 kWh/m²/year of all end-uses, varying by climate zone).	8.84 PJ
Éco-Énergie Tertiaire	Yes	Regulatory obligation imposing a 40% reduction in the services sector's final energy consumption by 2030. Building owners also have a reporting obligation to measure progress.	4.6 PJ
Subsidy for thermal renovation of private dwellings "MaPrimeRénov'"	Yes	State subsidy accessible to all owners of a main residence to finance insulation, efficient heating and ventilation systems or energy audit works. The level of the aid (up to 20k€/dwelling) depends on the household's income and can be improved for work on very poorly insulated dwellings.	8.20 PJ

Source: MURE

Transport

Consumption of the transport sector has decreased by 7.6% since 2000. Road transport accounted for 92,5% of the total in 2023, 61% of which can be attributed to cars. The remaining was split among rail (2.4%), domestic air transport (3.8%), and inland waterways (1.4%).

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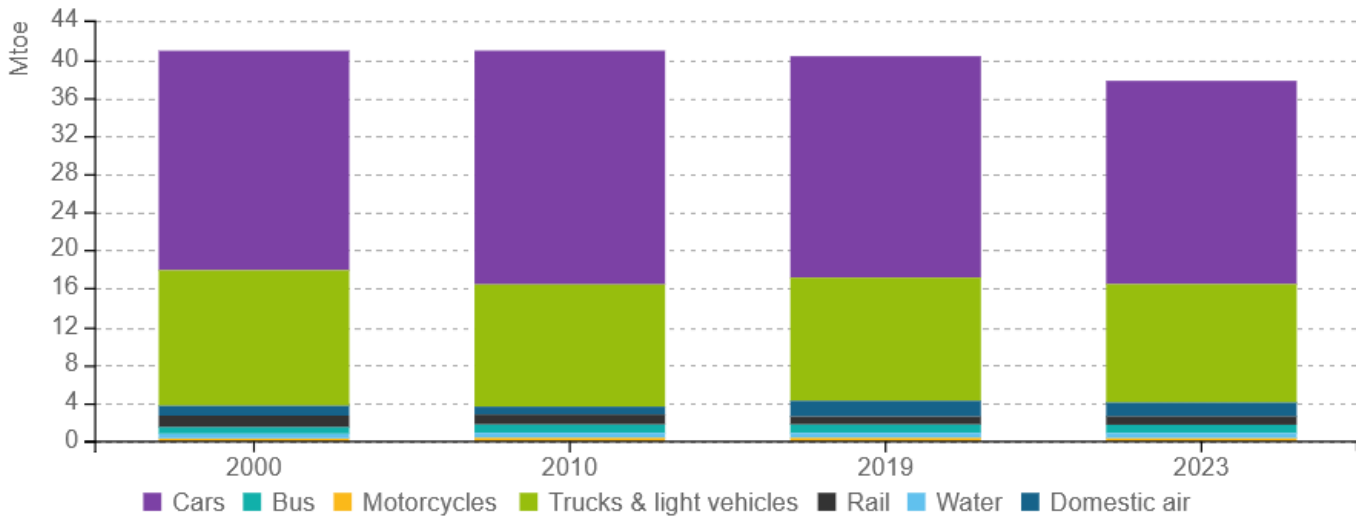
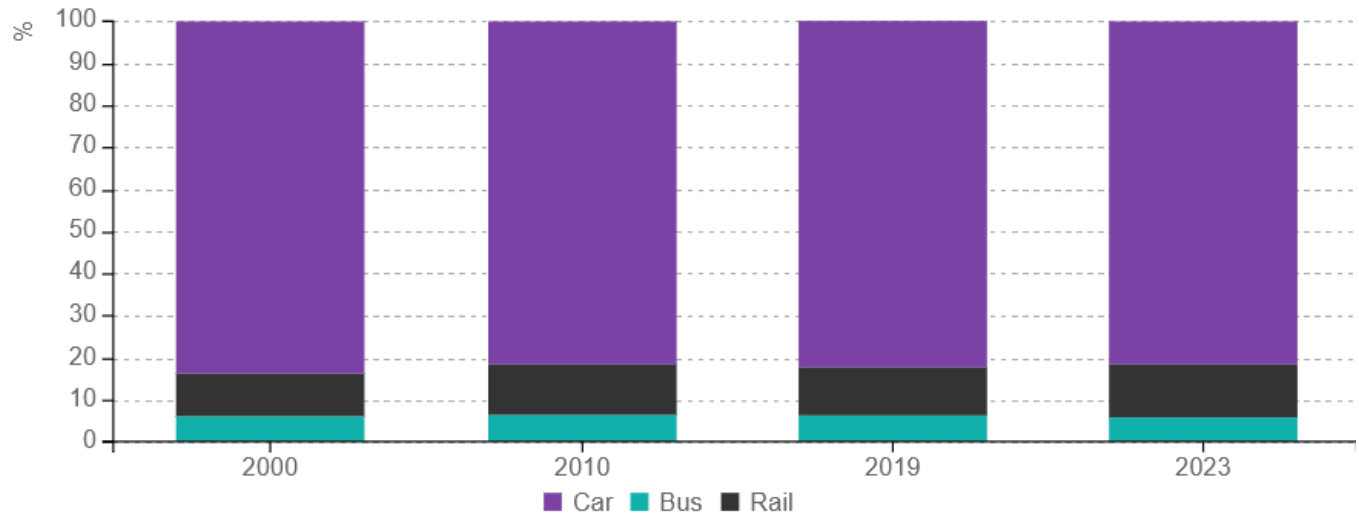
Figure 15: Transport energy consumption by mode



Source: ODYSSEE

Passenger traffic has been increasing by 13.6% between 2000 and 2023. Trains have seen the largest increase with 42% more passengers in 2023. Bus traffic has not yet returned to its pre-pandemic level but ridership is up 6.6% compared to 2000. Overall, cars account for the largest share of traffic with 81.7% in 2023 of land transport (i.e. excluding air).

Figure 16: Modal split of inland passenger traffic



Source: ODYSSEE

While passenger traffic remains steadier, freight traffic is more impacted by economic cycles. Freight traffic (ton-kilometre) decreased by 2.1% from 2000 to 2023. Freight traffic by train and river have the largest decrease with respectively -49.1% and -35%, while road freight has increased by 9.5% and has the largest share in 2023 with 88.9% of the total.

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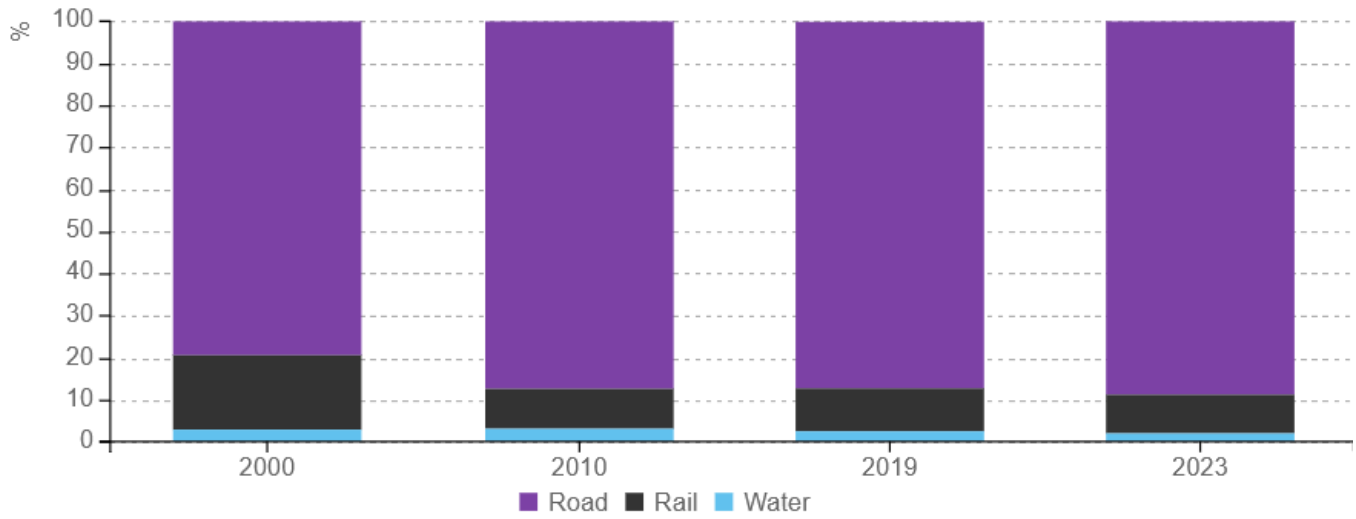
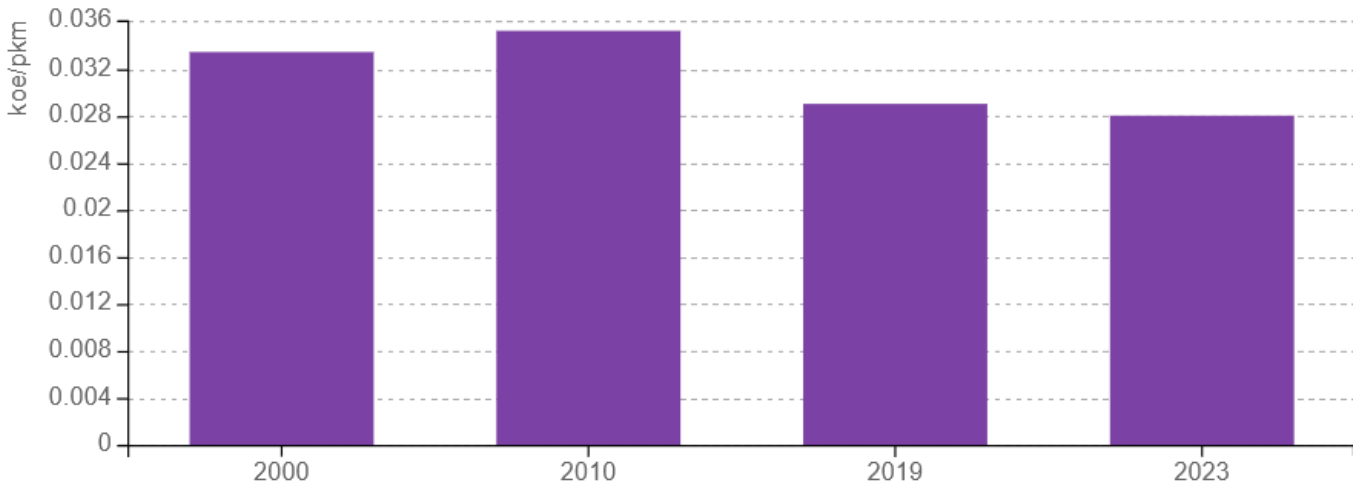
Figure 17: Modal split of inland freight traffic



Source: ODYSSEE

The energy consumption of cars per passenger has declined by 16.2% between 2000 and 2023, which represents an average decrease of -0.76% per year.

Figure 18: Energy consumption of cars per passenger-km



Source: ODYSSEE

Transport energy consumption was 0.5 Mtoe higher in 2023 than in 2010. The growth in traffic (+3 Mtoe) was more than compensated by energy savings (-5 Mtoe). Modal shifts had a negligeable effect, as the shift to more efficient modes for passenger transport was counterbalanced by a reverse trend for freight. Gains in energy efficiency might also be compensated by inefficient use of transportation, such as a low load factor (+2.6 Mtoe captured in “Others”).

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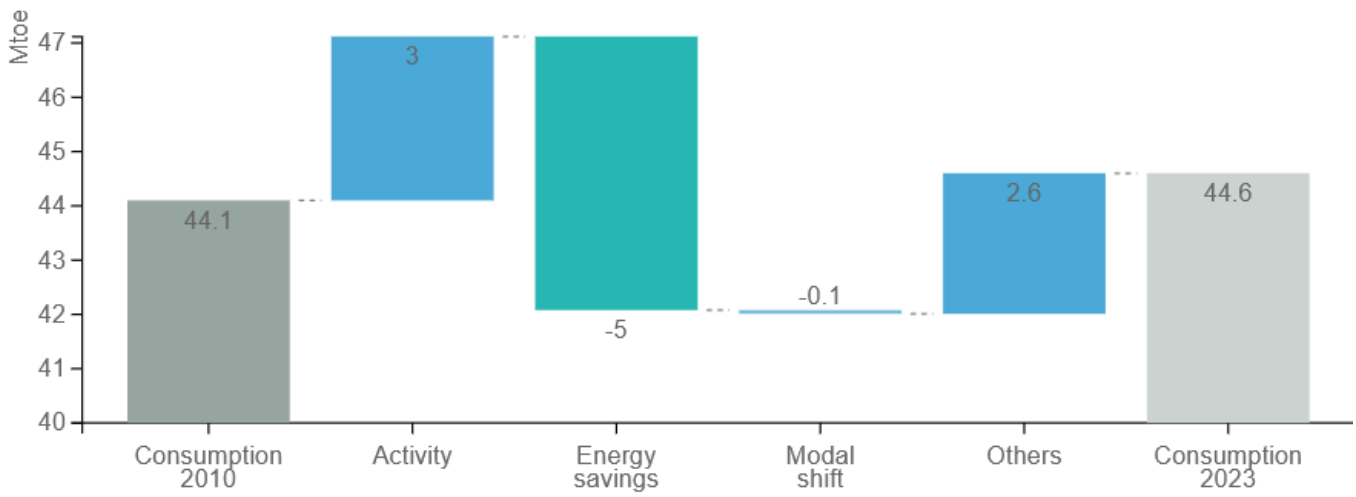
Figure 19: Main drivers of the energy consumption variation in transport



Source: ODYSSEE

Energy efficiency policies in the transport sector, are geared towards the compete decarbonization of the sector by 2050. They are mainly based on two points: i) Support for low emission modes of transport (modal shift); ii) Increase the penetration of efficient modes of transportation. Financial and fiscal incentives are used to encourage modal shift towards less energy-intensive means of transportation. Key measures include the ecological bonus-malus scheme (Bonus écologique) for new cars that is regularly revised, but also sustainable mobility allowances provided by companies to their employees to encourage modal shift. Energy efficiency measures are also driven by European directives setting mandatory standards for emissions from new vehicles, with the latest directive 2019/631/EC setting emissions targets for 2025 and 2030.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Bonus-malus scheme for new vehicle purchases	Yes	The bonus-malus scheme (called bonus écologique), based on the CO2 emissions per km, supports the purchase of vehicles with low CO2 emissions by giving bonus (up to €4,000) and penalizes the purchase of high emissions vehicles (more than 118gCO2/km in 2024) and heavy vehicles (1.6t) by giving a malus, respectively up to €60,000 (for cars with emissions higher than 193gCO2/km) and €30/kg(for cars heavier than 2.1t).	9.04 PJ
Electric leasing	No	Subsidised leasing scheme to support low-income households access to electric cars. The first year of the scheme enabled 50,000	5.43 PJ

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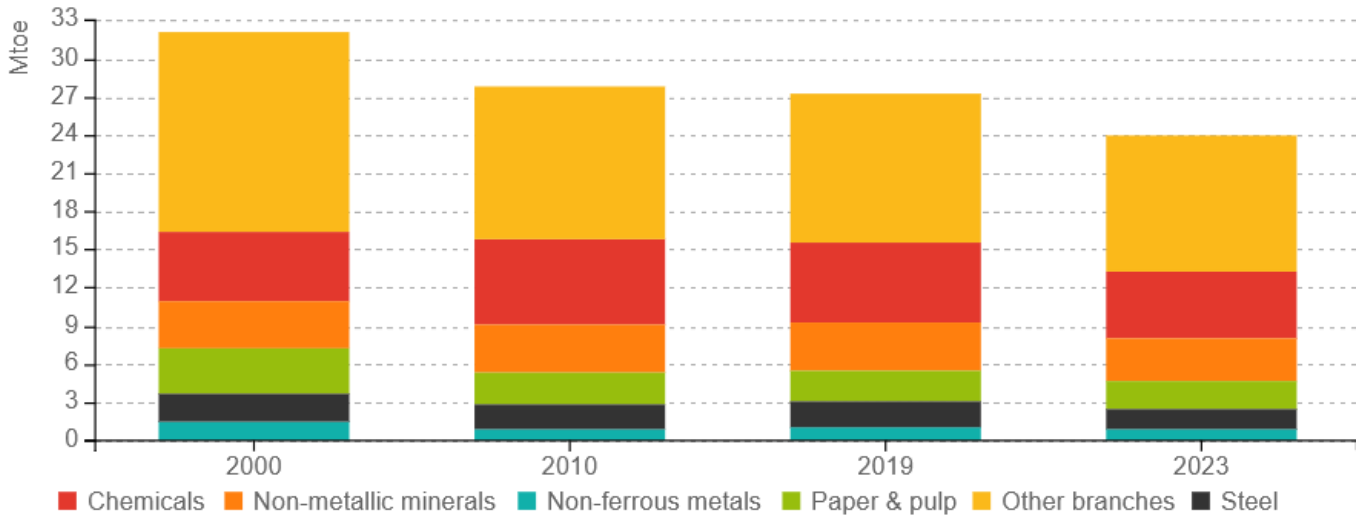
		households to lease for around 100€/month.	
Low Emission Zones	No	Low Emission Zones (Zones à Faibles Emissions, ZFE) are put in place by local authorities as a way to reduce air pollution in dense areas. These ZFEs are zones where the local authorities can restrict or limit traffic for certain vehicles based on their pollutants emissions levels.	5.43 PJ

Source: MURE

Industry

Industry's final energy consumption decreased by 1.3%/year on average between 2000 and 2023, reaching 24 Mtoe. Over half of the sector's consumption remains concentrated in 5 energy-intensive branches with 21.9% of total final energy consumed by the chemical industry, 14% by non-metallic minerals, 9.2% by paper, pulp and printing, 6.6% by steel, and 3.7% by non-ferrous metals. The consumption of chemicals and non-metallic minerals is slightly below their 2000 level, while consumption in the other intensive branches decreased more noticeably.

Figure 20: Final energy consumption of industry by branch



Source: ODYSSEE

Unit consumption of energy-intensive products is an indicator of energy efficiency progress. Steel unit consumption increased by 1.9% between 2000 and 2023. However, it has decreased since 2014, when unit consumption was 22.4% higher than in 2023. Paper's energy consumption per ton of paper produced increased slightly by 3.9%. Unit consumption for cement has been fairly stable overtime.

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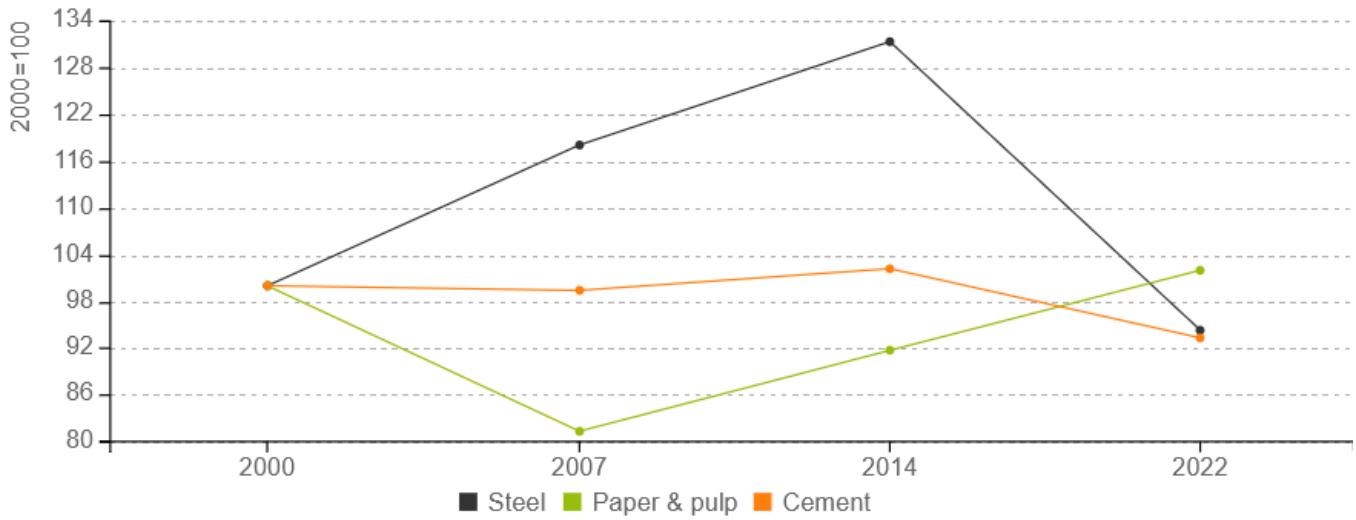
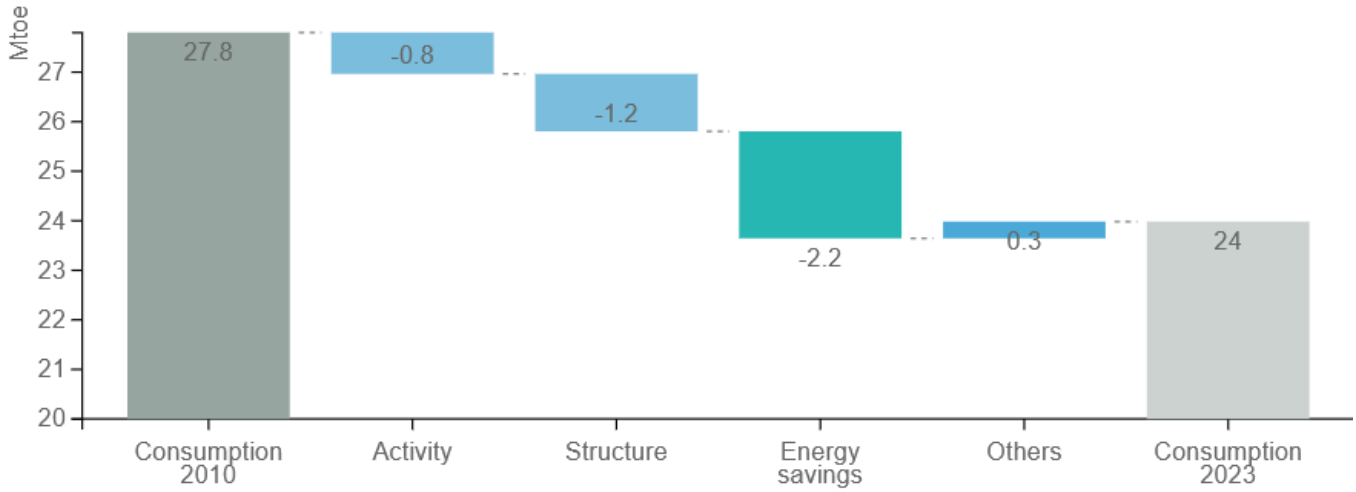
Figure 21: Unit consumption of energy-intensive products (toe/t)



Source: ODYSSEE

Since 2010, final energy consumption in the industrial sector declined by 3.8 Mtoe. This can be explained by the drop in industrial activity (-0.8 Mtoe), structural changes towards less energy-intensive branches (-1.2 Mtoe) and mainly by energy savings (-2.2Mtoe).

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



Source: ODYSSEE

French energy efficiency policies for the industry mainly rely on market instruments such as the EU-ETS and the Energy Savings Certificates scheme, which is going to be extended to all entities submitted to the EU-ETS in 2024 as an experiment. Regulatory measures are requiring mandatory energy audits every four years, under the transposition of the Energy Efficiency Directive (2012/27/EU). In 2020 the French Government adopted the France 2030 plan that directs €5.6Md of subsidies towards industrial decarbonisation, which complement other

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financial incentives targeting energy efficiency and low-carbon industrial heat, also supported by ADEME's Heat Fund. Financing instruments are also available to help industries comply with energy efficiency regulation, such as targeted loans for SMEs or investment subsidies.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Recovery Plan - National Low-carbon strategy – Funds for industry Decarbonization - Energy efficiency component	Yes	The aim of decarbonizing industry is to support industrial companies in investing in equipment and processes that emit less CO2. The aid covers industrial investments in the areas of energy efficiency, electrification and process adaptation that reduce CO2 emissions.	5.78 PJ
Support Programme for the Energy Transition of the Industry (PACTE Industrie)	Yes	The purpose of this programme managed by ADEME is to support industrials throughout their decarbonization and energy transition plan with tailored trainings and accompaniment services.	1.12 PJ

Source: MURE

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